THE ATHENÆUM

Journal of English and Foreign Literature, Science, and the Fine Arts.

No. 621. LONDON, SATURDAY, SEPTEMBER 21, 1839. PRICE FOURPENCE. (Stamped Edition, 5d.)

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LONDON, SATURDAY, SEPTEMBER 21, 1839.

REVIEWS

Thirteen Historical Discourses, with an Appendix. By Leonard Bacon, Pastor of the First Church in New Haven. New Haven, Durrie & Peck; London, Wiley & Putnam.

An Historical Discourse, delivered before the Citizens of New Haven, April 25, 1838. By James L. Kingsley. New Haven, H. & W. Noyes; London, Wiley & Putnam.

THE thirteen discourses, first above named, form a goodly octavo, and were delivered from the pulpit on the completion of the second century from the establishment of the *church* here mentioned. The first settlement of the *town* and *colony* of New Haven was celebrated about the same time, and this brought forward Mr. Kingsley—who is, we believe, a Professor in Yale College. There is an obvious propriety in noticing the two works together: Mr. Bacon furnishes a full share of the Ecclesiastical part of the history in question, and this is important, as will be seen; but it would not be complete without the more strictly Civil chronicle of Mr. Kingsley. These historical commemorations are, we believe, peculiar to America, and are full of a curious interest; not alone to those locally concerned, but to the general observer. The residents in the country towns, particularly in the New England States, have all the same custom of assembling together, at stated periods, to talk over "old times,"—as old, at any rate, as they can refer to; and Antiquity is a relative term, and, in the United States especially, its meaning depends much on circumstances. In all these cases, there is, doubtless, some good done. Stores of history are brought out. The occasion is, indeed, devoted to this purpose; and nothing can be better calculated than these festive celebrations, to excite a sense of both the interest and duty of "gathering up the fragments, that nothing be lost."

In America, fortunately, there is great encouragement to do this. The comparative recency of the settlements, the peculiar character of the people who founded them, the great importance they attached to ample records in every department,—these, and other circumstances, account for the facts we refer to. Thus every *town* in New England has its records, each church its chronicles. Out of these, were there no others, more general histories could be and are made—of counties, of states, of the nation at large. These latter, of course, must be collated with discretion. The abundance, itself, of material, is almost an obstacle in the way of the historian. He must select, sift, condense: he must see, especially, the bearing of what are called "trifling matters," which not unfrequently best illustrate the morals and manners of the age. The authors before us have some portion of this spirit. They have, too, enthusiasm; they do the drudging part with delight; it is a labour indeed, but with them a labour of love. There is a pleasure in reading what is so written, though there may be little in the matter of the work itself to concern us. There is, however, a great deal in this case, and we are now coming to it. We propose to trace out, with the assistance of these writers, the origin and progress of New Haven, from the beginning, Church and State. We consider their works as specimens of a class, and one of great historical interest. Here we are to look—the more remotely, the more minutely, the better—for the fountain sources of all true *Americanism:* we English, particularly, behold ourselves in such history under new and strange circumstances.

First, let us see how matters stand *now* with those good people, and what manner of men the celebrators are. New Haven, be it understood, though one of the chief places in the State of Connecticut, is still but a small place,—the population a few thousands only. The following is from the account of the celebration, appended to Mr. Kingsley's Discourse:—

"Arrangements having been made for the celebration of this anniversary, at about half-past eight o'clock, A.M., the citizens began to assemble near the southern portico of the State House. * * From the State House, the procession, comprising the various classes of citizens and strangers, proceeded to Temple Street, up Chapel Street to College Street, through College Street to its intersection with George Street; at which place under a spreading oak, Mr. Davenport preached his first sermon just two hundred years before. Here the procession halted, for religious exercises. The number here assembled was variously estimated from four to five thousand. The exercises of this place were commenced by singing four stanzas of the 80th Psalm, in the version of Sternhold and Hopkins.

O take us, Lord, unto thy grace, &c.

"Near the spot where the oak tree is supposed to have stood, a stage was erected, on which the Rev. Frederick W. Hotchkiss, of Saybrook, attended by the Rev. L. Bacon, offered prayer. Mr. Hotchkiss is a native of New Haven. His mother was a direct descendant of Gov. Jones, and thus connected with the family of Gov. Eaton."

We are then informed of the close of these religious exercises. The procession goes through other streets: it passes the spot where the houses of Davenport and Eaton, the fathers and founders of the city, once stood; it enters the church of the Society of which the former was once pastor, and near which spot the first house of worship in the colony was erected: here we have hymns, prayers, anthems, and the Discourse; and then this solemn company disperses to renew the ordinary course of society once more, and to enter upon the third century of New Haven. Now let us see how their ancestors commenced the first. Here is Mr. Bacon's account of the first Sabbath:—

"Look out upon the smooth harbour of Quinnipiack [the Indian name of New Haven]. It lies embosomed in a wilderness. Two or three small vessels, having in their appearance nothing of the characteristic grace, lightness and life of the well-known American vessels which are in these days found shooting over every sea, lie anchored in the distance. Here, along the margin of a creek, are a few tents, and some two or three rude huts, with the boxes and luggage that were landed yesterday, piled up around them; and here and there a little column of smoke, going up in the still morning air, shows that the inmates are in motion. Yet all is quiet; though the sun is up, there is no appearance of labour or business; for it is the Sabbath. By and by the stillness is broken by the beating of a drum; and from the tents and from the vessels, a congregation comes gathering around a spreading oak. The aged and the honoured are seated near the ministers; the younger, and those of inferior condition, find their places farther back; for the defence of all, there are men in armour, each with his heavy unwieldy gun, and one and another with a smoking matchlock. What a congregation is this, to be gathered in the wilds of New England. Here are men and women who have been accustomed to the luxuries of wealth in a metropolis, and to the refinements of a court. Here are ministers who have disputed in the universities, and preached under Gothic arches in London. These men and women have come into a wilderness, to face new dangers, to encounter new temptations.—For the first time since the creation, the echoes of these hills and waters are awakened by the voice of praise. The word of God is opened; and their faith and hope are strengthened for the conflicts before them, by contemplating the conflict and the victory of Him, who, in all things the example of his people, was once, like them, 'led forth by the Spirit into the wilderness to be tempted of the Devil.'"

Here is food for reflection; matters of "pith and moment" are involved in it, which even the actors in the drama think not, know not of. And who are they? Why came they here? What will become of them? We feel already an eagerness to be advised of the issue as well as the interpretation of movements so strange. But, before answering these questions, let us continue a little further the history which suggested them, for this is still more life-like. We find a "meeting-house" raised in the season next following their arrival. This is worthy of notice, when we consider how few were the colonists—some score or two of householders—and what were the emergencies of their situation. Money was scarce, too: they had suffered large losses. We are speaking of a band of emigrants to a wilderness, in 1639. However, 500*l.* were levied on the people; a building was set up at once, fifty feet square,—wooden, of course; the interior plain enough, the floor covered with long broad benches, instead of pews: in front of the rude pulpit was a high seat for the ruling elder; before that, a little lower, sat the deacons, fronting the communion-table and the congregation.

"From time to time, the number of men that were to bear arms on the Sabbath days, and other days of public assembly, the time at which they should appear at the meeting house, and the places which they should occupy, were made the subjects of particular regulation. Seats were placed, on each side of the front door, for the soldiers. A sentinel was stationed in the turret. Armed watchmen paced the street, while the people were assembled for worship. And whenever rumours came of conspiracies among the Indians at a distance, or there seemed to be any special occasion of alarm, the Sabbath guards and sentries at once became more vigilant, and the house of God bristled with augmented preparations for defence. For example, in March, 1653, there being apprehensions of an Indian invasion, and a town meeting being held, that nothing needful in such circumstances might be neglected, we find it ordered, among other particulars, that 'the door of the meeting house next the soldiers' seat be kept clear from women and children sitting there, that if there be occasion for the soldiers to go suddenly forth, they may have a free passage.' Of the six pieces of artillery belonging to the town, there were stationed always by the water side, and three by the meeting house. Twice before each assembly, the drum was beaten in the turret and along the principal street, and when the congregation came together, it presented the appearance of an assembly in a garrison. Yet how strictly were their Sabbaths sanctified. 'From evening to evening,' no unnecessary labour was any where permitted. Let us go back, for a moment, to one of those ancient Sabbaths. You see in the morning no motion, save as the herds go forth to their pasture in the common grounds, each herd accompanied by two or three armed herdsmen. At the appointed hour, the drum having been beaten both the first time and the second, the whole population, from the dwellings of the town, and from the farms on the other side of the river, come together in the place of prayer. The sentinel is placed in the turret; those who are to keep ward, go forth, pacing, two by two, the still green lanes. In the mean time, we take our places in the assembly. In this rude unfinished structure, is devotion true and pure,—worship, more solemn for the lack of outward pomp. The learned and fervent Davenport, and the rhetorical and polished Hooke, divide between them the duties of the pulpit. Before them are such hearers as the honoured Eaton, Goodyear, and Gregson; the warriors Turner and Seely; the Newmans, discreet and beloved; the modest and true hearted Gibbard; and, that terror to inattentive school boys, Master Ezekiel Cheever. Sometimes, too, we might see in the audience, the father of his country, venerable alike as a philosopher, a statesman, a patriot, and a saint,—the younger Winthrop. Through a long course of exercises, which would weary out the men of our degenerate days, these hearers sit or stand with most exemplary attention. They love the word that comes from the lips of their pastor. They love the order of this house."

Of some of the characters here mentioned, we may have more to say: that noble fellow, Winthrop, the younger, was introduced to our readers, not long since, by Mr. Bancroft (*Athen*, No. 588). Mr. Bacon goes on to speak forcibly of the pleasure these sacred exercises, and *all* exercises of rights and duties, must have had for men who had paid for them so dearly. But who were these colonists? We have remarked, on former occasions, the strange picturesque motliness of the American settlers. This was less the case in the North: these New Haven people were almost all *Londoners*—mostly mercantile men. It seems odd to find such characters at *Quinnipiack* engaged as we have seen them; but so it was.

Mr. Kingsley mentions that some of the emigrants took out their servants with them, and a "large amount of property:" this, however, must be interpreted with reasonable allowance. It is not probable that any of them were rich, even for that period; for we find that Governor Eaton is spoken of, in 1656, as the richest among them, while his estate in the colony was estimated, when he died, at less than 1500*l*. This, indeed, was no small fortune, as the times went. Eaton's real estate was rated at only 500*l*., yet this comprised "two farms, and the half part of the mill," besides a house. This was independence, if not opulence: it was sufficient to command—so far as fortune could—public respect. The old historian, Hubbard, says of the Governor, he "maintained a post in some measure answerable to his place."

The colony was remarkable in another respect—there was great general intelligence in it: and not general intelligence merely, but learning, talent, high breeding. There were five or six "ministers of the gospel," as Mr. Bacon styles them, in this colony—ordained clergymen of the Church—all educated at our universities. One of these married a grand-daughter of the Earl of Rivers; another—Hooke—had for his wife's near kinsman no less a man than Cromwell, with whom he seems to have been intimate at home; and with whom he corresponded from America. Hooke, indeed, was finally induced to return home; and he was appointed, by Cromwell, his domestic chaplain, in conjunction with the celebrated John Howe. Thus, in Burton's Diary, in—

"The order of procession at the funeral of the Protector, the 'chaplains at Whitehall, Mr. White, Mr. Sterry, Mr. Hooke, Mr. Howe, Mr. Lockyer, Mr. [Hugh] Peters,' had a place assigned them. A few files after these, by the way, was the place of the five 'Secretaries of the French and Latin tongues, one of whom was 'Mr. John Milton.'"

The remains of Hooke, we believe, lie in Bunhill Fields. John Davenport and Samuel Eaton (the Governor's brother) were two more of these men. Davenport was from Coventry,—son of the mayor: he studied at Oxford, and subsequently became vicar of St. Stephens, in Coleman Street, where he soon gained a great reputation. One of his congregation was *Theophilus* Eaton, a Coventry school-mate of old—a merchant now. The intimacy was renewed; and, eventually, these two became leaders of the expedition which went out to New Haven in 1637: and, to anticipate the narrative a little, there, in the green wilderness of Connecticut, they raised their dwellings "over against each other, on the same street," so that "the voice of prayer, or the evening psalm, in one, might always be heard in the other:" and there they grew old together, and in death were not divided. A strange contrast this to the life of *another* Coventry school-mate; this was Davenport's cousin Christopher. They were in one college at Oxford; but, writes Mr. Bacon, while

"The one became a most thorough and fearless Puritan, the founder of a Puritan Church and colony in the wilderness of the new world, the other, with much of the same native genius and temper, after some two years' study in Oxford, became a papist, went to the continent, and connected himself with the Franciscan order of friars, pursued his studies at Doway, and in one of the universities of Spain, and at length came back to his native country, a Romish missionary, eminently learned and accomplished, under the assumed name of Franciscus a Sancta Clara. In this capacity, he became one of the chaplains to Queen Henrietta Maria, the wife of Charles I. He was an active, leading spirit in those stormy times, doing great service for the popish cause in England, raising money among the English papists for all sorts of purposes; writing books, gaining proselytes, and intriguing in all quarters, (the archbishop himself not excepted,) to bring about a reconciliation between the National Church of England, and the Church of Rome!"

Theophilus Eaton, above named, was the first governor of the new colony,—and was eighteen times, in succession, annually chosen to fill that office. He died in 1657, and Mr. Kingsley gives us his epitaph:—

> Eaton, so famed, so wise, so meek, so just,
> The Phœnix of our world, here hides his dust;
> *This name forget, New England never must.*

It appears clearly what justice there was in this last sentiment, as well as in its application also to Davenport, who continued at the head of the Church for thirty years. The distinct influence these men exercised on the community,—on the country which rose around them, is remarkable, and it spread still wider when they were no more. Both our authorities are full on this point, and here, again, do we get at the sources of all that is best and most characteristic of New England, even at the present day. The waters at the spring-head are not more translucent than such history; every pebble and shell on the lowest deep shine through it. Witness this specimen of the town records in 1667:—

"Mr. John Davenport, senior, came into the meeting, and desired to speak something concerning the school; and first propounded to the town, whether they would send their children to the school, to be taught for the fitting them for the service of God, in church and commonwealth. If they would, then, he said, that the grant of that part of Mr. Hopkins, his estate, formerly made to this town, stands good; but if not, then it is void; because it attains not the end of the donor. Therefore, he desired they would express themselves. Upon which Roger Alling declared his purpose of bringing up one of his sons to learning; also Henry Glover one of Mr. William Russell's, John Winston, Mr. Hodshon, Thomas Trowbridge, David Atwater, Thomas Meeks [Mix]; and Mr. Augur said that he intended to send for a kinsman from England. Mr. Samuel Street declared, that there were eight at present in Latin, and three more would come in summer, and two more before next winter. Upon which Mr. Davenport seemed to be satisfied," &c.

Here again the hand of these master-spirits is apparent:—

"Among the early proceedings of the General Court, while its jurisdiction was confined within the limits of Quinnipiack, we find that an order was given to establish a public school for the instruction of youth, and a committee was appointed to consider 'what yearly allowance is meet to be given to it out of the common stock of the town.' This order was made at the same time in which the planters were taxing themselves very heavily for the erection of bridges. The very year in which the 'fundamental agreement' was entered into, we find a record, that Thomas Fugill is required to keep Charles Higginson, an indented apprentice, 'at school one year; or else to advantage him as much in his education, as a year's learning comes to.' Charles Higginson was probably the first apprentice indented in the colony, and this condition of his apprenticeship was recorded, undoubtedly, as an example."

Those who ridicule the Puritans must be a little careful, lest comparisons be made between the state of things and the standard of character, in the old country and the new. How much had all England's affluence, learning, experience, and benevolence, or love of liberty, or love of knowledge done for the education of the people when, in that poor desert colony,—

"The select-men of every town were required to see that none 'suffer so much barbarism in any of their families,' as not to 'teach their children and apprentices so much learning, as may enable them perfectly to read the English tongue;' and by a subsequent statute, it was made the duty of the grand-jurymen in each town, once a year, at least 'to visit suspected families and satisfy themselves, whether all children under age and servants in such suspected families, can read the English tongue, or be in a good procedure to learn the same.'"

As to the effect of these regulations Mr. Kingsley states—

"That a gentleman, who for half a century, has been as extensively conversant in the courts of the State, and in the business of public offices, as any other, lately informed me, that he had never met in the course of his business, with a native of Connecticut, who could not read; and with but two, who could not write; and he adds that the late Judge Reeve of Litchfield, after forty years' experience in the courts of Connecticut, remarked, that in his business, he had met with three natives of the State who could not write; but with no one who could not read."

These are the natural consequences of the laws established by the founders of the State, but here they stop not. Farther on, we are reminded that—

"The numerous emigrants from those States, where common schools were first established, have, in their wide dispersion, carried the system with them. A school they have considered as next in necessity to a shelter from the elements; and as the forests disappear at the west, one of the first structures in a New England settlement, which greets the eye, is the school-house."

Even this is but an indication. When the Valley of the Mississippi swarms with a population of a hundred millions,—when Wisconsin and Missouri, and all these later Americas, now forming their infant systems on the Quinnipiack models, shall hold in their turn the patriarchal relation to empires spreading yet farther west, then our children's children may endeavour to estimate what was the dignity of the mission of such men as we have shown the New Haven leaders—the two Coventry school-boys—to have been.

We have given little as yet of the history of the young Church itself, though Mr. Bacon, as might be expected, has a great deal to say on the subject. Indeed, it is, for a time, the history of the colony: the Church was the State in the first era, and the parent of it in the next. This ought to be distinctly understood: there has been quite cant enough about Connecticut fanaticism, and "*Blue Laws*" (which, we suspect, never existed), and other nonsense of a like character. Let us, therefore, endeavour to do these people justice. With this purpose, we must imagine ourselves in their position. They are all men of a religious character. This was, and is, the bond of their union. They are all of one creed. Their relation to the Church and to the state of the old country is the same,—nonconformity, self-exile for conscience sake. Their *former* relation this, for now they could scarcely be said to hold any. Their civil situation was anomalous. Plymouth colony called itself subject to James. Massachusetts had a royal charter. "Connecticut" proper, (not New Haven, though *in time* united with it,) acknowledged the authority of Massachusetts: and so on with the rest. But New Haven had got quite clear of all jurisdictions, as it wished to be. It had escaped the authorities in the Old World, and it kept aloof from those in the New. They were, in fact, and they meant to be, in what the writers

call *a state of nature*:—here is one specimen of a community beginning the world anew. What follows? They form a "plantation covenant" at once.

"They engaged, 'that as in matters that concern the gathering and ordering of a church, so also in all public offices, which concern civil order, as choice of magistrates, and officers, making and repealing laws, dividing allotments of inheritance, and all things of like nature, they would all of them be ordered by the rules, which the Scripture held forth to them.' This we are told, may be considered the original civil constitution of the New Haven colony."

So much for the emergency. Whether we approve of this covenant or not, *they* did—and they were their own masters. This first business settled—for business it was—they went to their other labours, secondary, but not small. They chose their temporary magistrates—bought up Indian lands—laid out their little town—surrounded it with palisades—and commenced tilling the soil. And now the state was to be regularly organized. A general meeting was held in a large barn: all the planters were admitted to this truly democratic and primitive assembly. There they reconsidered the great business of founding a society. Prayers were offered. Mr. Davenport addressed them. Discussions ensued, no doubt; and then they unanimously agreed to the principle that—

"The Scriptures do hold forth a perfect rule for the direction and government of all men in all duties, which they are to perform to God and men, as well in families and commonwealth, as in matters of the church."

The covenant was renewed, and then comes another important regulation:—

"That church members only shall be free burgesses, and that they only shall choose magistrates and officers among themselves, to have power of transacting all the public civil affairs of the plantation; of making and repealing laws, dividing inheritances, deciding differences that may arise, and 'doing all things and businesses of like nature.'"

This, too, was unanimously approved of by the leaders; it was a favourite measure; and they have been harshly dealt with in consequence,—too harshly, we think. This implies no defence of the measure,—no championship of Puritanism at large. The character of that sect is thoroughly and ably discussed by our authors, and both acknowledge its faults. Neither justifies the regulation just mentioned. But why condemn the Puritans so furiously on such grounds? why select them as the scape-goats of the age they lived in? why expect the liberality and light of 1839 from those who flourished in 1639? The Puritans need not fear to be tried by any just, any contemporary standard. How long is it, as we asked when noticing Capt. Marryat's attack on them, since the Test and Corporation Acts have been repealed in England?—how long since the Catholic Relief Bill became the law of the land? This same church-member regulation was no worse than the English law on the subject; and these colonists had an excuse for retaining it, peculiar to their position. They had left England to escape from what they considered ecclesiastical intolerance. How natural then to seek to protect themselves after the established fashion; to become "*the Church*" so far, as to retain the power their exile had now given them in the hands of their own people: to retain it merely, was, in *them*, no crime; it did not imply interference with other men's rights. It was self-defensive. They might be overrun by their enemies at any moment without such a precaution. Laud always threatened that his "long arm should reach them." Mr. Kingsley, indeed, goes much farther than this, and asserts—

"That the early laws of Connecticut, enforcing attendance on public worship, concerned congregationalists alone; as none other than congregationalists were in the colony. In the year 1665, when the king's commissioners visited New England, they reported, that the people of Connecticut 'will not hinder any from enjoying the sacraments, and using the common prayer book, provided that they hinder not the maintenance of the public minister;'—as high a religious privilege, as any enjoyed by dissenters in England at the present day."

For half a century, be it remembered, there were no concessions to be made; the colonists were of one mind; they were all congregationalists, and how they chose to manage their affairs, or what laws to agree to, concerned only themselves. When—

"Religious societies *were* formed in Connecticut, which adopted the ritual of the church of England, not only were these societies allowed, but all belonging to them, as soon as it could be conveniently done, were released from contributing to the support of the congregational ministers. The same liberty was allowed to those who adopted other forms of worship; nor is there reason to believe, that these changes in the original enactments were made, without the concurrence of a large majority of the congregational clergy. * * No example can be produced [says Mr. Kingsley] in the whole history of christian nations, where a community unanimous in their religion, and urged by so many inducements to maintain it, have changed their laws, and made every concession desired, more promptly, fully, and cheerfully, than the people of Connecticut."

Enough on this point. The laws compelling attendance on public worship, belong to the age; they were in force in England. There was a law against heretics, but this was after the European example; and there are but few known instances in which it was enforced. The notorious case is that of the Quakers; but as we observed heretofore, the error was in punishing these people for their opinion,—for their conduct they justly merited punishment. The belief in witchcraft was universal: Cudworth said, in 1678, that those who disbelieved it, "*can hardly escape the suspicion of some hankering towards Atheism!*" and our laws against it were unrepealed till the ninth of George II.

The amount of all this may be soon stated. The Puritans were the great liberal party of their day. The fact of their self-exile for liberty's sake is proof of this: their character confirms it. The character of the 2,000 ministers, ejected in one day for non-conformity, will not suffer by comparison with the character of those who were not ejected. Lightfoot, Gale, Owen, Baxter, Betts, Charnock, Howe, were among these men. Elliot, Hampden, Selden, Vane, Pym, Ireton, Milton, were of their party. Their works, as the founders of a new empire, speak for them still more,—their care of the great interests of education and religion, is alone sufficient for their honour. Mr. Kingsley, indeed, fearlessly asserts, that they first "laid the foundations of free communities,"—free in a sense which, then, the world had never known, had never imagined to be possible. Think what they endured, and ventured, and accomplished; and how high above the standard of the age they lived in was the glorious spirit, the ruling motive, which stirred them up to these exertions. And then consider their works. By their fruits we know them. Mr. Bacon must be allowed to speak for them here. He admits all that can be fairly brought against them, but, with a fine national feeling, which we like, for there is something *English* in it, he adds—

"Their labours, their principles, their institutions, have made New England, with its hard soil and its cold long winters, 'the glory of all lands.' The thousand towns and villages,—the decent sanctuaries not for show but for use, crowning the hill-tops, or peering out from the valleys,—the means of education accessible to every family,—the universal diffusion of knowledge,—the order and thrift, the general activity and enterprise, the unparalleled equality in the distribution of property, the general happiness resulting from the diffusion of education and of pure religious doctrine,—the safety in which more than half the population sleep nightly with unbolted doors,—the calm, holy Sabbaths, when mute nature in the general silence becomes vocal with praise, when the whisper of the breeze seems more distinct, the distant waterfall louder and more musical, the carol of the morning birds clearer and sweeter—this is New England; and where will you find the like, save where you find the operation of New England principles and New England influence? This is the work of our fathers and ancient lawgivers. They came hither, not with new theories of government from the laboratories of political alchymists, not to try wild experiments upon human nature, but only to found a new empire for God, for truth, for virtue, for freedom guarded and bounded by justice. To have failed in such an attempt had been glorious. Their glory is that they succeeded."

But we must bring this long notice to a close. We should like to have followed up more completely the progress of the colony, step by step—the first elections—the division of lands—the early administration of the laws—the beginnings of domestic and foreign commerce—till, in 1655, the first regular Code was compiled by Governor Eaton, at the request of the General Court, printed in England, and distributed among the planters. Ten years afterwards, the celebrated Charter, procured by Winthrop from Charles II., united New Haven with Connecticut. This union has since continued without interruption. We should like, also, to have sketched the adventures of the Regicides, mentioned in the works before us. No less than three of the men—Whalley, Goffe, and Dixwell—who condemned Charles, fled to Connecticut. The curious wanderings of the two former we must pass by: but there is some romance even in the following plain passage:—

"One of the first persons received by Mr. Pierpont to the full communion of the Church, was an aged man, known here by the name of James Davids.—There was that in his dress and manners, in his great acquaintance with the public affairs of England and of Europe, and in his obvious desire of retirement, which led several of the most intelligent persons in the town to regard him, from the first, as one of those whom the restoration of the monarchy had made exiles from England, and whom their pastor had exhorted them beforehand to shelter and protect. Mr. Jones, in particular, recognized him as one of King Charles' judges, whom, in his youth, he had often seen in London and Westminster; but with him, of whose fidelity Whalley and Goffe had made so full an experiment, the perilous secret was safe. The retired stranger, who had his lodgings with Mr. Ling, received much of the confidence of those who became acquainted with him. He was twice married; by his first wife, the widow of his friend Ling, he acquired a house and a considerable property. He attended to some little business, which gave him the title of a merchant, and sometimes he aided in the settlement of estates.—He was greatly respected, not only for his intelligence, but for his piety. After his death, when another revolution in England had placed William and Mary on the throne, it became generally known that the equivocal initials on his grave-stone, 'J. D. Esq.' designated the last resting place of John Dixwell the regicide."

So much for New Haven. It is a small spot to have been noticed at such length; but character does not depend on size: and next to Boston, probably it may be considered as the fountain-head of American institutions and character.

History and Practice of Photogenic Drawing on the true principles of the Daguerréotype, with the true method of Dioramic Painting. By L. J. M. Daguerre. Translated by J. S. Memes, L.L.D. Smith, Elder & Co.

All information, relating to Photogenic Drawing likely to interest the general reader, has already appeared in the *Athenæum*: and as no abridged account of the various processes and

manipulations would serve the purpose of those who desire to practice the art, we shall content ourselves with referring all such persons to the work before us, which contains the full particulars as set forth by M. Daguerre himself. As, however, it was further agreed between the Artist and the French government, that he should make known the secret of painting and illuminating his Dioramic pictures, a subject of considerable interest, though overlooked in the eagerness with which we have all sought for information relating to the greater discovery, we shall avail ourselves of this opportunity to give some information on the subject.

"The canvas (M. Daguerre tells us) is painted on both sides. In this case, therefore, whether the subjects be illuminated by reflected or refracted light, one indispensable essential is, to employ a medium or canvas which is exceedingly transparent, and the texture of which is as equal as possibly can be obtained. Either lawn or calico may be used."

"When the canvas thus selected is stretched it is necessary to prime it, on both sides, with at least two coats of parchment size.

"The first effect, which ought to be the clearer of the two, is executed on the right side of the canvas. The sketch is first made in black-lead, taking care not to sully the canvas, the whiteness of which is the sole resource possessed by the artist for bringing out the lights of the picture; for white cannot be used in executing the first effect. The colours which I use are ground in oil, but laid upon the canvas with turpentine, to which sometimes I add a little animal oil, but only for deep shadows, and these latter may be varnished without injury. The manipulation is exactly the same as in water-colour painting, with this difference only, that the colours are prepared with oil instead of gum, and applied with turpentine instead of water. It will readily occur to the artist that he can employ neither white nor any opaque colour whatsoever by coats, which in the second effect would occasion spots more or less tinted, according to the greater or less degree of opacity. It must be the endeavour of the artist to bring out effects at a stroke—at once; going over an effect injures the transparency of the canvas.

"The second effect is painted on the wrong side of the canvas. The artist in executing this part of his work must employ no other light than that which comes from the front of the picture through the canvas. By this means the transparent forms of the first effect are seen; these forms must either be preserved, or painted over, according to the effect intended. First of all, a wash of some transparent blue is put over the whole canvas. This coating, like the other colours, is prepared in oil, and laid on in essence of turpentine. The marks of the brush are effaced by a huge tool of badger's skin. By means of this coating the seams also are concealed to a certain extent, by taking care to lay it on thin along the selvedges, which have always less transparency than the rest of the canvas. When this coating is dry, the alterations intended to be made on the first effect, are sketched out. In executing this second effect, the artist has nothing to do beyond modelling in light and shadow, without reference to local colour or to the colours of the first picture, which are seen by transmitted light as transparencies. This part is executed by means of a tint of which white is the base, with which lamp-black is mixed in order to obtain a grey, the strength of which is ascertained by applying it to the wash of blue on the wrong side, and then viewing it from the right side of the picture, from which position it will not be at all perceptible if of the proper strength. The gradation of tones is produced by the greater or less opacity in this tint. It may happen that the shadows of the first effect interfere with the execution of the second. To remedy this inconvenience, and to conceal these shadows, we can harmonize their force, by using the gray of a corresponding opacity according to strength of the shadows which it is the intention to destroy. It will occur to the artist, that it is necessary to urge this second effect to its utmost power. When this general effect of light and shadow is finished on these principles, and the desired effect obtained, the picture may be coloured, the artist using only the most transparent tints prepared in oil. It is still a water-colour that is to be executed; but less turpentine must be used in these glazings, which produce a powerful effect only in proportion as they are repeated several times, and with more of oil than essence. However, for slight effects of colour, turpentine is sufficient.

"The first effect painted on the right or front of the canvas is lighted by reflection, that is to say, only by a light which comes from the front, while the second effect—that painted on the wrong side receives its light by refraction; that is, from behind only. In both effects we may employ both lights at once, in order to modify certain portions of the picture. The light which gives effect to the painting in front should come from above. The illumination which falls upon the second effect—that painted behind, should come from vertical openings, it being always understood that these are to be completely closed when the first effect only is to be seen. If it happen to be necessary to modify a part in the first effect or picture by a light belonging to the second, that is, coming from behind, then this light must be inclosed so as not to fall, except on the proper place. The windows or openings ought to be distant from the paintings at least two metres, [between 7 and 8 feet English] in order to give a power of modifying the light by transmitting it through coloured media, as the exigencies of desired effects may demand. The same means are requisite for the first effect or front picture."

M. Daguerre then proceeds to explain the principle on which these effects are produced:—

"The colours which appear on objects generally are produced only by the arrangement of the molecules of these objects. Consequently all those substances used in painting are colourless: they only possess the power of reflecting such or such a ray of light which in itself contains all the colours. The more pure these substances are, the more decidedly do they reflect the simple colours, never, however, by an absolute or independent property, which by the way, it is not necessary they should do in order to represent the effects of nature. To explain then the principles upon which Dioramic paintings are executed and lighted up, take as an example the effect produced when light is decomposed; that is to say, when a portion of its component rays is intercepted. Put upon a canvas two colours—the brightest possible—the one red, the other green, both as near as may be of the same intensity. Now, interpose a red medium, as a coloured glass, in the stream of light which fall upon them—what happens? The red colour reflects the rays which belong to it; the green remains black. Reverse the experiment by interposing a green glass—the effect is also reversed; the green colour gives forth its proper reflection; the red is now black. The effects, indeed, are not perfect unless the interposed media completely exclude all rays but their own, a condition not easily obtained, for coloured media have rarely the power of excluding all but one ray. The general effect, however, is sufficiently determined. To apply this principle to dioramic paintings, though in these paintings there are only two effects represented, one of day in front, one of night behind. These effects not passing the one unto the other without a complicated combination of the media which the light had to traverse, produce an infinity of other effects similar to those which nature presents in her transitions from morning to night, and the reverse. It must not be imagined that it is necessary to employ media of very intense hues in order to obtain striking modifications of colour, for often a slight shade in the medium suffices to operate a very great change in the effect."

The following observations are of general application:—

"It will be understood from these principles of dioramic art, in which striking results are obtained by a simple decomposition of light, how important it is to observe the aspect of the sky when we would appreciate the tone of a picture, whose colouring matters are thus subject to decompositions so great. The best light for this purpose, is that from a pale sky; for where the sky is blue, it is the blue tone of the picture also, and consequently its cold tone which comes out most powerfully, while its warm tones remain inactive. Their media are not present, and they are cast comparatively back into neutral tints by the blue medium of the sky—so favourable to the cold tones of the picture. It happens on the contrary, when the sky is coloured, that the warm tones of the picture—its reds and yellows—come forth too vigorously, and, overpowering its colder tones, injure its harmony, or, it may be, give it quite a different character—a warm instead of a cold tone of colour. It is easy to understand from these observations that the uniform intensity of colours cannot be maintained from morning to evening. We may even venture to assert it to be physically demonstrated that a picture cannot be the same at all hours of the day. This, perhaps, is one of the causes which contribute to render good painting so difficult to execute, and so difficult to appreciate. Painters led into error by the changes which take place between morning and evening in the appearance of their pictures, falsely attribute these alterations to a variation in their manner of seeing, and colour falsely, while, in reality the change is in the medium—in the light."

It appears to us worth the consideration of the Messrs. Ackermanns, and the other dealers in ingenious toys, whether small and portable Dioramas might not be constructed at a trifling expense, and to the gratification and instruction of their young friends and best customers.

An Inquiry into the Morbid Effects of Deficiency of Food, chiefly with reference to their occurrence among the Destitute Poor, &c. By R. B. Howard, M.D. Simpkin & Marshall.

In the discussions which have recently been maintained on the subject of national education, it has been the fashion to term knowledge the intellectual food of man, and to place our rights and duties in the matter on a parallel with those connected with our bodily nourishment. There are undoubtedly many satisfactory grounds for such an analogy, and there can be no rational doubt that education is as much the staff of social life, as bread is the staff of our natural existence. But they who are best acquainted with the circumstances of English society, and with the working of its existing civilization, will go with us yet a step further, and admit that a denial of education is, strictly and literally, equivalent to the denial of daily bread. In plain English, a very considerable aggravation of that prevalent distress among the lower classes, which the author of the work before us demonstrates to be a wholesale destroyer of health and life, is distinctly referrible to ignorance of facts and of principles, within the competence of the humblest classes to understand and to apply, if justice and humanity were observed in legislating for their instruction. Putting aside all considerations connected with what is called the Malthusian system, and abstaining from those complicated reasonings by which it might be proved that the operative classes possess the means of regulating the value of their own labour, if they had but the knowledge of fact necessary to direct their efforts, it is manifest to demonstration that the actual wages of the labourer, properly and economically applied, would be productive of a notable increase of comfort, and would avert some of the more pressing evils, which, at present, are altogether uncontrollable. There is abundant evidence, not only that much waste occurs in the present application of the poor man's resources, as to the all-important article of food, but that he suffers considerable injury in his health from deficient ventilation and deficient cleanliness in his dwelling, insufficient and filthy clothing, and general want of accommodation, to all which he is subjected by the ignorance imposed on him through the obstinacy or the neglect of a careless or a prejudiced legislature. Without, however, adverting to the obscure routine of the labourer's domestic existence, we need but instance a notorious example, in the enormous waste of wages incidental to the late Chartist movements,—a waste that assuredly will be widely felt during the ensuing winter, in

those shapes of malady and of death, of which Dr. Howard has given but too faithful a detail. Such a destruction of the poor man's property is incessantly going forward, during the continuance of useless and mischievous strikes. Into these the operative is seduced by the absence of that knowledge of first principles, which it is the duty of society to afford; but which has scarcely entered even into the most comprehensive schemes of national education. Still more grievous is the waste, daily and hourly occasioned, by another species of ignorance, betraying the victims into an abusive substitution of intoxicating and stimulating articles of consumption, for food more congenial to nature, and more profitable to health and strength. In the ruder and simpler life, incidental to primitive times, when manufactures were not, and when agriculture was less than a science, the unaided mother-wit of uneducated man might perhaps have proved sufficient, under ordinary circumstances, to prevent the labourer from absolutely starving; but under the extremely artificial and complicated conditions in which England is now placed, the maintenance of life has grown into an art, which simple experience alone will not teach, and which demands the aid of all the information that systematic teaching can confer.

The pamphlet, at present under consideration, is a sketch, and but a sketch, of the medical phenomena attendant on deficiency of food, as exhibited regularly and habitually in the hospitals and dispensaries of the town of Manchester. We are not aware that our readers, in general, will derive much medical information from its perusal; but we are nevertheless anxious that it should meet with an extensive circulation, for it is capable of suggesting considerations of vast importance to the welfare of all classes, and which they should have perpetually before their eyes. It is above all things necessary that the more adequate notion which this little work conveys of that fearful abstract substantive "starvation," should be impressed on the public mind. The idea which most persons entertain of starvation, is that of a total privation of food, continued till it terminates in death. The liability to this condition is believed to be occasional and exceptional; and it is conceived that in the parish officer we have an efficient agent for applying a remedy. Dr. Howard, however, will teach the holders of these opinions, that besides such cases, and infinitely transcending them in individual misery and in public mischief, there is a lingering starvation, that presses habitually on thousands and tens of thousands, leading to the grave by a multiplied series of long-protracted ailments and infirmities. Dreadful as such inflictions are to contemplate, as mere affections of health, they are but the abbreviated signs of many other sufferings and incapacities, moral and physical, of which no detail of narrative can adequately display even the outline. That starvation, such as Dr. Howard describes it, in all its intensity, *rages* only at particular times, may be urged in abatement; and it is perhaps true, that when it attracts public attention, it usually calls forth a charitable effort affording some approach to temporary relief. But starvation, thus restricted, would still be a formidable feature in the physiognomy of English society, from the mere frequency of its recurrence. We, however, are of opinion, that Dr. Howard's experience warrants a still larger inference; and indicates that, in populations circumstanced like that of Manchester, there is a section by which a full and complete diet is never habitually enjoyed, which exists in a condition of permanent weakness and disease, and in which mortality habitually commits havoc far greater than the average standard of the entire community. That such is the portion of a large fraction of our pauper population, may be collected from the peculiar diseases which prevail in that class; diseases which are usually attributed to cold, damp, badly ventilated habitations, dirt, and many other secondary causes. Such causes, at least, if not absolutely subordinate to want, still derive, as Dr. Howard justly remarks, no small part of their malignity from the impaired constitutions on which they act.

"The instances (he says) in which defective nutrition is followed by what may be called, its special and characteristic signs, are infinitely more rare, than those in which it acts merely as a predisposing cause of morbid action, and favours the developement of some specific disease. The destruction of life amongst the poor, in this indirect manner, is most extensive; but, from death being readily referred to some particular disease, to which a name can at once be given, it attracts little notice. In many of these cases, there is nothing peculiar in the symptoms, to indicate the real cause of their origin; the disease may be far advanced before a medical man is consulted, and his attention, as well as that of the patient himself, being more especially directed to the present pathological condition of the organ affected, unless the former is minutely particular in his inquiries; the true source of the complaint may not be recognised, or may fail to make any strong impression. Yet in estimating the mortality amongst the destitute poor from scarcity of food, we must not forget that the result is still the same, whether the privation is so complete as to destroy life in ten days, or so slight and gradual, that the fatal event does not occur till after many months' suffering."

And again,—

"There is a great variety of chronic diseases, whose origin is excited, or whose progress is increased with frightful rapidity by inadequate nutrition; and the number of persons amongst the poor, whose death is accelerated from this cause, it is melancholy to contemplate. It is amongst these habitual invalids that the greatest mortality occurs during periods of distress; yet except in a very few instances, the remote cause of death is unknown to the public, and this event is considered merely as the natural and necessary consequence of the disease under which they were labouring, at the time of their decease. Even if any suspicion is aroused that a person has died of starvation, and a *post mortem* examination instituted to ascertain its probability; if structural disease of any important organ is found, it is too generally assumed, as a matter of course, that death has arisen from natural causes. Yet no conclusion can be more fallacious, for persons affected with organic diseases are certainly not less susceptible of the effects of deficiency of food than healthy individuals, and not less likely to perish in consequence."

What is generally called the "struggle for existence," the "pressure of population upon its resources," and, under these names, is talked of in discussions with so much complacency, is nothing more or less than this deficiency of food; and *that*, we believe, is felt to an extent affecting the constitutional health, not merely in pauper populations, but in families that never figure on the parochial lists. We have no doubt that hundreds of respectable individuals,—that is, persons decently dressed, and living by the exercise of some art above day labour,—suffer, though in a less degree, from deficient nourishment, and are the victims of a tea and bread-and-butter diet, less nutritious than the half-diet of hospitals. This, by impairing their strength, lays them open to fatal maladies, from which a more generous fare would have protected them; and, indeed, converts their life into one long disease. We are satisfied that at the back of these victims, (most commonly females), there exist, even in the shop-keeping streets of the second order, in this metropolis, whole families who maintain their position only by the most rigid privations, and who, if not absolutely without sufficient food, live under perpetual apprehension for themselves and their dependents, seeing the workhouse for ever before their eyes, and suffering severely in their constitutions by depressing passions and over-work.

With a pressure like this acting on so large a portion of the population, there can be no difficulty in understanding the state of discontent and repining with which the working classes behold the ease of the capitalist, or the readiness with which the crudest and most nonsensical doctrines find credence and instigate to tumult. To ascribe these feelings to the political differences of Whig and Tory, of Churchman and Dissenter, is absurd; the evil lies far deeper. While any considerable portion of the population lingers and dwindles under the influence of insufficient food, with constitutions impaired, and passions inflamed, morality is out of the question.

To the same evil, so strikingly displayed in Dr. Howard's dry medical details, we are compelled also to refer a large part of the distaste with which the reformation of the poor law has been regarded. They who know, from the near inspection of neighbourship, the sufferings of the half-employed artizan, view with a natural and laudable sympathy restraints put upon his claim to relief through public charity. The reasonableness of such restrictions they either cannot, or, in their indignation, will not see. They regard the circumstances under the influence of excited feelings; and passion is ever blind and impetuous.

The most deplorable part, however, of this case, (and it cannot be too frequently stated,) is, that poor laws, however laxly administered, are no remedies for general deficiency of food. Poor laws are calculated to grapple only with casual pauperism, they must fail *in toto* to relieve that poverty which arises from constantly deficient employment, or, what comes to the same thing, an employment perpetually fluctuating, and disturbing the regular action of those social laws which should govern the progress of population. Dr. Doyle, the celebrated Catholic bishop, well remarked on this subject, "You may pass laws to have the hungry fed and the naked clothed. Your laws cannot work miracles, and can be of no avail, without a developement of the resources from which such necessary funds are to be drawn." The notion of raising the habitual condition of the poor by the agency of charity involves this plain absurdity, that a nation can afford to support by donation those whom it cannot feed by a demand for labour.

The leading and master cause of the actual condition of the working classes, of their privations and their discontents, which are even now striking at the commercial prosperity of the country, and through that at the existence of social order itself, is the relative weakness of these classes, their want of that power which knowledge should confer, concerning their relations, political, social, productive, and consuming, with the rest of society. The circumstances of society which have complicated these relations to a degree that requires all the knowledge of the practical economist and philosopher to embrace, have developed themselves too suddenly to admit of a spontaneous and instinctive adjustment; and whenever a deliberate effort on the part of the people has been called for to meet new contingencies thus arising, they have been found uniformly unprepared and unequal to the task. The present and the last generations have, consequently, witnessed the progressive depression of the labouring classes, who have been, as it were, squeezed out of the pale of society by the operation of forces which they could not comprehend or resist. While every other class has been acquiring an immense mass of knowledge of the most various description, qualifying the individuals for the more active exertions they are compelled to make, and raising them in the scale as producers, as citizens,

and as rational beings, the sons of labour have not merely remained stationary, but have retrograded. Experiencing a painful diminution in the sum of their physical comforts, and compelled to make greater efforts barely to keep body and soul together, their moral existence has been proportionately narrowed, their feelings have been stifled or perverted, and their sum of acquired knowledge lessened. They know fewer facts connected with their own well-understood interests, and they are less capable of reasoning upon them. We hear much of the advance of knowledge among the operatives, but the establishment of mechanics' institutions, and other similar establishments, are confined to the workmen of a superior order: such institutions cannot co-exist with a want of bread; and no inference can be drawn from them respecting the intellectual condition of the class of which we are writing. With respect to these, we repeat it, deficiency of food, or what comes very close to it, has been as injurious to their minds as to their bodies; while their position in society is hourly becoming less tenable. So large a portion of the community cannot continue thus deeply disorganized, without drawing the rest into a corresponding derangement; and to prevent disturbances fatal to a commercial country, unusual efforts, corresponding in magnitude with the evil, must be attempted. In setting about organic ameliorations, little can be done *for* the people; the greatest good can only be effected *by* the people, and *through* the people. To this end their influence in society must be increased, and their hands strengthened; but to do this safely, their minds must be enlarged, and their means of information greatly extended. The pending dispute on National Education, is between those who would make all things subordinate to what they call religious instruction, and those who would give a precedence, in the order of time, to reading and writing. We believe that both parties fall short in their views of the required course, though the former are more in error than the latter. Reading and writing are, in our times, necessary preliminaries to efficient instruction, whether scientific, moral, or religious; and to saddle education with restrictions which will drive large classes from the national school, is to deprive them of religion also. We need but enter any of the forlorn habitations of the manufacturing poor, to witness their deplorable ignorance, and observe the obstinate prejudices with which that ignorance is surrounded, in order to be satisfied of their inaptitude to receive theological ideas. All the efforts of all the clergy in the world would fail to inculcate on persons thus situated a wholesome religion, or to place them on the road to believe wisely, and practise healthfully. We look, therefore, on the opponents of national education, (however little they may be aware of the fact,) as the enemies of religion, and as the real practical revolutionists, who are placing all the interests of society and civilization in jeopardy; and we shall take their success (if succeed they do in the struggle) as the harbinger of a destructive revolution.

But, on the other hand, we believe the advocates for mere reading and writing to fall far short of the necessities of the case. We think that the education which the working classes require, to preserve them from a state of semi-starvation, with all its medical, moral, and social consequences, is an education which will enable them not only to grapple more effectually with the physical evils, but to assist themselves as citizens, and to do so wisely. They must be trusted with an education that will not leave them weak for all wholesome influence on the higher classes, and all-powerful for mischief, whenever distress becomes sufficient to induce them to pull together. In one word, they must have an education not of words, but of things; beginning with the physical elements which act on their bodies, and on which they re-act, and proceeding from material objects steadily and gradually to those higher considerations, which affect their utility as citizens, and their happiness as rational beings here and hereafter. On the present proposed systems, the order of instruction is absolutely inverted. The first necessity of man is to exist. While his bodily wants are unprovided for, he must be incapable of comprehending the necessities of his spiritual nature. The order of instruction, then, must follow the march of the necessities for instruction; and a *sic volo, sic jubeo*, of the upper classes cannot change it, without forfeiting all the ends, religious, political, and social, for which education is desirable.

Let it not be said that these ideas are Utopian, and that there is no practical connexion between education and productive power. We think few will rest contented with the tendency of the actual course of events, with its Chartist revolts, agrarian incendiaries, and restless impatiences, besetting all classes of the labouring population. "Whatever is" is most manifestly *not* right, or good for anybody in the state, high or humble: it is worth while, then, to inquire what better can be substituted. That a want of education is at the bottom of the present condition of the working classes, is a general truth; but it does not exclude the action of other secondary and subordinate causes. When, therefore, we urge attention to public ignorance, we by no means intend to shut our eyes to the workings of the corn laws, and of all impediments to a free trade in labour. On the contrary, we are perfectly aware that amongst an educated population such anomalies in legislation would not be tolerated for an instant; and we acknowledge that the attempt to educate must be accompanied by the redress of many other grievances.

ANTHOLOGY FOR 1839.

The philosophers have, for some weeks past, had it all their own way in our columns; and it is time that the weekly increasing claims of the poets to an audience should be admitted. We wish that their representatives on the present occasion came armed with some better arguments than their number, and had furnished us with the opportunity of proving, out of their own mouths, that there is more harmony between the poets and philosophers than the profane suspect. By way, however, of making the best of the materials at our command, we will *graduate* from the one to the other, by selecting for our connecting link a philosophical poem (the author calls it, without stating why, a *national* one), boldly assuming a metaphysical purpose, and copiously illustrated by physiological notes.

'*Blindness, or the Second Sense Restored and Lost*,' is a poem in three parts, and all varieties of measure, by Andrew Park, and undertakes to grapple with the poetical sublimities and deep morals of that subject which Milton first touched and left—drawing from it, however, a music so high and mournful as might have deterred more timid spirits from following up his theme. Mr. Park's mode of illustrating his subject differs, however, from Milton's. The dreary conditions of that state of "total eclipse" in which the natural world has "no sun nor moon" for the sufferer, but all is "dark amid the blaze of noon" (and which the author expresses by the phrase of the "opacous eye") are strikingly suggested by allusions to such dangers as those which the blind man incurs of being run over by coaches—particularly in the Strand (p. 25); while a moral compensation of the evil is pointed out in the instinctive care which nature instructs the parent animal to bestow upon puppies during their nine days' blindness (p. 31), and an alleviation of the personal inconvenience is proposed in the occupation of basket-making. The moral of the whole is nevertheless a melancholy one,—the author being obliged, in spite of all the compensations which he can suggest, to add—

> Yet think not four full senses in their might,
> Can recompense the painful want of sight!

The volume is interposed with songs, one of which we might have transferred to our pages, as furnishing in a convenient form an example of the quality of the author's poetry, but that we are deterred by the great array of prohibition by which these *feræ naturæ* are guarded. Not only are we met at the opening of the volume by a general caution to trespassers, but, by the side of many of the individual songs a particular spring-gun is advertised in the shape of a note, announcing the special party who is fortunate enough to have a property in the lyric in question, and leaving to poachers no protection against consequences. As a single example, however, of the boldness of expression employed by our author, let the reader take the following,—where, speaking of the personal stature of man as being extremely insignificant beside that of a mountain, he adds:—

> Yet, when ambitious, what will he not dare?
> Even acts which make the very angels *stare!*

The following passage which we have no particular reason for selecting, may serve to illustrate as well as another, the recondite philosophy of the work:—

> Now thou would'st be a king, ay! and would'st be
> The worshipped of the land, and idolized!
> Not pleased with thy high power.
> Well, I will show
> How little greatness lies between a worm,—
> A crawling reptile! and an earthly king!
> Well now, to close the strife. There thou art dead,—
> Where is thy glory, now?—For ever fled!

And for a specimen of the curious historical facts by which the subject is enriched, take this:

> Great Samson, when in bonds, seemed so severe,
> The Philistines crouched 'neath his piercing gaze,
> Thus trembling at his looks with palsied fear,
> They might have put a period to his days,
> But rather chose to quench his eyes' dread rays,
> Than mutilate his power.

The physiological notes are, for the most part, topographical and statistical,—furnishing, for example, a guide-book description of St. Paul's Cathedral (the cost of the edifice, weight of the bell, circumference of the clock, number of steps by which the whispering gallery, golden gallery, and ball are respectively reached, &c.)—the proper hour for visiting Hyde Park—descriptions of Woolwich, with the number of cannon kept there, the Tower, Chelsea, and Greenwich Hospitals, and various other curious phenomena connected with the malady of blindness.

'*Early Efforts*,' is a small volume of poems, by the Misses Moss, very young ladies of the Hebrew nation, but not likely ever to take their places amongst "the sweet singers of Israel." Whether it be that the Hebrew can indeed not "sing the Lord's song in a strange land," true it is that "Zion's lute," which has sent such majestic music down the stream of time, has long hung untouched upon the willows. The harp of Judah is, in our day, no better than a "Jew's harp." The volume before us is one of that numerous class which, according to the statement in its preface, owe their publication to the indulgent partiality of friends; and we can, therefore do no better than refer it back to *them* for re-consideration.

'*The Fall of Saul*,' by John Gunning Seymer, M.A. of St. Alban's Hall, Oxford, recommends itself to our notice, in all the dignity of "a sacred epic poem," divided into six books, and having for its subject the events which immediately preceded the fall of the monarch Saul. Milton is the model which the author has proposed to himself; and accordingly, the Miltonic forms and phraseology have been imitated with some success. The author need desire no better proof that these are no portion of the poet himself, than the result of this experiment. The accomplishments of a scholar are here wasted upon a purpose which Mr. Seymer must not hope to attain. There is not a solitary evidence of inspiration throughout his long and elaborate poem, although it is constructed of materials which came into his hands poetry, but became prose under his manipulation. The fevered and haunted spirit of Saul, now soothed by the voice of Michael, or the harp of David, and now prostrate beneath the shadow of that destiny which is irresistibly advancing—the friendship of David and Jonathan, "passing the love of women,"—and the scene of unhallowed incantation (with all its solemn circumstances), in the witch's cave at Endor, are topics so touched with the sacred

fire of poetry in the page of Scripture, that it is difficult to understand how they can have been so divested of their spirituality, and cooled down to the temperature of this drama. These Scripture themes, which the Hebrew had handled before, are to be handled by few in our day. Mr. Seymer must not hope to be numbered amongst those who, like Milton, "touched the mountain, and it smoked." In justice to him, however, we will give, as a most favourable specimen of his powers, the scene in the den of the sorceress; and our readers will judge for themselves, if he has improved upon the Hebrew version:—

By this the King
Before the cavern stood, when Albrok thrice
His palms together smote, and at the sign,
Beneath the utmost verge of that huge arch,
Appeared the sorceress, her aspect such
As when by the Asphaltine lake, she held
Communion with the fiend. A lamp she bore,
That 'mid ten thousand shapes of crystal growth,
(Which o'er the rock wide incrustation spread,)
Did multiply itself into a light,
More lustrous far, than ever on the feast
Of orient despot shone. The Hebrew king,
From that wild form recoiled, as with a glance
That seemed by meteor kindled, Edris scanned
His height majestic. O'er her bosom, passed
The flash of dark suspicion; yet no eye
Might read upon the tablet of her brow,
Her thoughts; as thus she spake:
"What seek ye here?"
As falls on some benighted one, the roar
Of distant cataract, or where the Nile
Through Nubia pours his tide, or where with shout
Ineffable, Niagara descends
From foam-clad precipice, so on the ear
Of Saul, those accents came, mournful yet sweet.
A moment, wrapt in thought he stood, ere thus
With low obeisance, he answer made.
"O thou, whose potent voice to the deep world
Which holds the dead, can pierce, I pray thee aid
Through thy familiar spirit, and bring up
From darkness, him whom I to thee shall name."
So speaking, toward the sorceress, he stretched
The gifts of divination. From the gold,
Her hand recoiled, as she him thus bespake.
* * * *
She ended, and the Hebrew train obeyed,
When with a gate, massive and high,
Edris the ingress closed, and by a path
Within the living rock, the strangers led
To where a chamber (that from sun-lit sky,
Scarce caught through fissured vault, a twilight day)
Received their steps. Then first, the lonely lamp
Which on that hall sepulchral shone revealed
The stamp of habitation rude. Now paused
The sorceress, and with a voice to which
The echo of that rock-girt solitude
Strange terror lent, thus spake:
"Whom shall I bring
Thee up?"
To whom the Hebrew king: "Bring up
Elkanah's son."
He said, and on the lips
Of Edris are the words that once could search
The unseen world. Breathless the son of Kish
Beheld, but heard not. Wanly gleamed the lamp
As by a mist involved bred from the strife
Of hope, and fear, (within his breast that raged,)
Or from the pining of his nature, worne
By fast and vigil.
Now had Syria's clime
Half swept the hemisphere of night, as ceased
The muttered spell, and from the earth uprose
What seemed a man, who long with things that draw
No growth from dust, high brotherhood had made.
'Tis won, the boon of fear is won, and he
For whom the wail was erst at Ramah raised,
Hath left the viewless clime which, far or near,
Must hold awhile the race from Adam born,
Twixt this probation hour and final doom,
In pause of destiny, that ends the war
Of good and ill within each spirit waged
From birth to death, in peace, o'er which is hung
Rapture of bliss or woe, to which the thrill
Of utmost joy or grief that in this sphere
May shake the heart, were coldest apathy.
As where the pencil's course hath been, appears
Some shape of hues impalpable, so stood
That shadow by the sorceress alone
Descried. Upon the king, a mournful glance
He turned, whilst on the mind of Edris, came
Remembrance of the warning by the fiend
Pronounced.

'*The Triumph of Drake, or, the Dawn of England's Naval Power*,' is a ballad-poem, by R. Grimbald Bigsby, D.C.L., &c., describing the visit of Queen Elizabeth to Sir Francis Drake, at Deptford, on board the ship in which he had achieved the circumnavigation of the globe, and is principally remarkable for its attribution of all the superlatives of grace and beauty to that notorious spinster, now, when nothing is to be got by it, and by the author's assurance, that the royal progress from Greenwich to Deptford, as a spectacle, made Cleopatra's celebrated passage of the Cydnus a thing not worth speaking of. The writer's estimate of his own poetry may, perhaps, be gathered from the fact, that he composes a song of triumph for the occasion, which he puts into the mouth of Spenser, and praises accordingly. The real purpose of the poem, however, seems to be, to commemorate the deposit in Greenwich Hospital of the astrolabe of the great navigator, which had descended in Mr. Bigsby's family, been liberally presented by him to the Sailor-King, William the Fourth, and by that monarch transferred to its present custody in 1831. To call public attention to this fact, and perpetuate it in his family, has obviously been the fair and honourable object of this publication; and this object takes it out of the category of criticism.

OUR LIBRARY TABLE.

An Analysis of One Hundred Voyages to and from India, China, &c., performed by Ships in the Hon. East India Company's Service, by Henry Wise, late chief officer of the Company's ship Edinburgh.—After a good deal of trouble and close examination, we have at last made out the true character of this book, and that in spite of the title. The book is designed to recommend the use of a small steam-engine on board merchant vessels trading to India and China generally, and of the Patent Propellers of Mr. Melville in particular. The voyages to India and China come into the book merely in the first place by making a book of it; and in the second place, of showing that in these,—the *auxiliary aid* of a steam-engine, with Mr. Melville's Patent Propellers, would have been particularly useful, and have saved a good deal of time. The object of this little book, after we have thus made it out, is to a great extent a good one. Mr. Wise shows, by a careful analysis of a number of voyages selected from those made by the once princely fleet of the East India Company, that a great amount of time might have been saved by the use of a small steam-engine on board these merchant ships. He gives an analysis of one hundred voyages, extracted from the logs of the Company's ships,—such examples as the following:—

In the Outward Voyage of the *Taunton Castle*, out of 2,736 hours, or 114 days,

	938	hours calm or light airs.
1,389	,,	fair wind.
409	,,	foul wind.

If, therefore, steam-power had been used, by having a small engine on board, such a voyage would have been shortened by 3×938 hours, $=2814$ miles, reckoning the use of steam to gain three miles an hour, which a very small engine would sufficiently accomplish.

In the Homeward Voyage of the *Batavia*, out of 3,768 hours, or 157 days,

1,834	hours were	calm or light airs.
1,446	,,	fair wind.
488	,,	foul wind.

In this case $3 \times 1834 = 5502$ miles would have been taken from the length of the voyage. By a general abstract, given at the end of the book, it appears that the following may be taken as an average of passages from England to Bombay:—

868	hours	calm or light airs.
1,518	,,	fair wind.
306	,,	foul wind.
Total .. 2,692		

The logs are of themselves an interesting collection, and may be useful to young navigators, as illustrating the various results of different courses, and the different seasons of making the voyage. We have no doubt that steam employed to aid these vessels would be of essential service, whether Melville's propellers or another kind of impetus were used; but the question is entirely one of finance and mercantile economy. On this most important question Mr. Wise has not entered, but he has furnished some valuable data, of which those who are interested in this inquiry, will do well to avail themselves.

The Modern Literature of France, by George W. M. Reynolds.—*The Authors of France*, by Achilles Albites.—*Translations and Sketches of Biography, from the German, Italian, Spanish, Portuguese, and French Languages*, by a Lady.—*The Death of an Angel and other Pieces, translated from the Works of Jean Paul Friedrich Richter*, by A. Kenney.—The thread upon which we string together these four books, may be but a slight one, yet it is coloured by the spirit of the time. If we augured merely from the shop-windows, from the 'Pictures of the French drawn by themselves,' running in lively parallel to our own 'Heads of the People,' or from the 'Penny Novelist,' which treats its readers to translations from D'Arlincourt and Chateaubriand, and (by way of variety) Paul de Kock—these way-side testimonies would, of themselves, serve to convince us that the same spirit is stirring here which has made Bulwer's name a household word in Germany, and transplanted Pickwick to the deserts of Siberia. In short, if John Bull be not positively growing a linguist, he is opening his ears to "the foreigners" far more widely than he used to do. It therefore behoves us critics to take especial care that his increasing toleration and liberality be not abused: and, without emulating the strait-lacedness of some worshipful contemporaries, to examine the pack of each new Autolycus, who brings wares from foreign parts, and "forewarn him that he use no scurrilous words in his tunes." With this feeling we cannot say anything in favour of Mr. Reynolds's volumes. The writer undertakes to prove, in opposition to the *Quarterly*, that the generality of French novels are not licentious; but there is a tone of lax morality and false principle in all his strictures and notices, a disposition to walk on the edge of the debateable land with his eyes fixed on the wrong side of the frontier, everywhere discernible, which, in our opinion, makes his own book extremely objectionable: fortunately, its mischievous tendency is neutralized by its dulness—by the bad taste of the selections and the feebleness of the translations.—The next little book on our list, by Mr. Albites, is of a better quality, though calling for no higher or more extended praise, than such as befits an innocent manual for the use of schools, being merely a presentment of the 'Authors of France,' in a pill-box.—The third volume, in the field of foreign literature, takes a far wider range. The "Lady" has read nearly as many modern languages as Father Prout himself: we dare not add that she has read them as well, or laid hold on their treasures with as happy an audacity. But as translating is a more intellectual and elegant pastime than the elaborating of such rich needlework as the Mrs. Barnabys conceive essential to the maintenance of a gentlewoman's estate,—a pastime, therefore, worthy of recognition and encouragement,—we will not apply ourselves severely to criticize the fruits of her labours.—The fourth book of the quartett is to us the most interesting. It is true that fragments of Richter's writings have been already laid before the English public, two of his novels translated, and there was a time when every magazine thought it judicious to give its own gems from the 'Genoveva' and the 'Phantasus:' but, as his pages are filled with deep thoughts and poetical images, yet more than quaint and racy humour, Richter is precisely one of those writers beyond the power of such passing visitants to exhaust. The selections before us have not been made with any extraordinary judgment: the work wants variety, but in turning over its pages cursorily, we were stopped again and again by detached passages of depth and originality and fantastic beauty.

Researches on the Developement, Structure, and Diseases of the Teeth, by A. Nasmyth.—The nature and object of these researches are declared in our account of the recent proceedings of the British Association. It would be difficult to give to our unscientific readers, in the merest outline, an idea of the importance of this work, of the whole extent of difference existing in the opinions of the most approved authors respecting the structure of the teeth, or of the difficulties which beset the investigation. Suffice it to say, that even in the present moment, it is not decided whether the teeth should be referred to the osseous system or to that of the mucous membrane. The volume now before us contains merely the historical introduction, forming the first of a series of publications hereafter to be expected. The field of inquiry demands the exercise of the highest mechanical dexterity, and of the most profound physiological knowledge. Neither persevering labour nor scientific ingenuity alone, will, in this instance, avail. The facts to be ascertained are of an order the least obvious to the senses, and must be sought by a felicitous dexterity perseveringly employed; and when ascertained they can be applied only by those, to whom the most transcendental reasonings of anatomy are familiar. We state this much with the hope of conveying to our more profes-

sional friends, some notion of the utter incapacity of the host of scribbling dentists to do justice to a theme of which so many of them profess an intimate acquaintance; and to put the public on their guard against showy superficial pretensions, that are no guarantees for merit of the kind, of which they are intended to be a puffing advertisement.

Duncan's History of the Dukes of Normandy.—This volume will be found a useful supplement to the ordinary Histories of England, in which we have only brief and incidental notices of the continental possessions of our Norman sovereigns. The style is pure and simple, the information given in a condensed form, and the statements are supported by references to the best available authorities.

Little Godfrey, the Hermit.—This is a translation from the German, and contains a striking example of the benefits resulting from resignation to the divine will. Unfortunately, its piety is deeply tinged with asceticism.

Solly's Syllabus of Logic.—This is a clever attempt to combine the systems of Kant and Aristotle; but the dissertations are so very abstract that they are likely to repel all but the most ardent students.

Brennan's Old and New Logic.—An attempt to contrast the logical systems of Aristotle and Lord Bacon, which is not remarkable for a sound knowledge of either the one or the other.

Keble's Selections from Hooker.—The passages selected are those which illustrate the Book of Common Prayer.

Stories for the Fire-side.—The design is better than the execution.

Advice to Cadets, by Henry Kerr.—An ingenious way of recommending a particular house of agency, in which Mr. Kerr is a partner.

The Flower-Basket, by Dr. Schmidt.—A disagreeable story, translated from the German.

Memoirs of a Cadet.—The author had little to say, and he has said it in no more words than were requisite.

Rollo at Work.—Abbott's juvenile works are too exclusively American to be worth reprinting in this country.

Cousin Elizabeth.—A story well designed, but badly told.

Riddle's Latin Dictionary Abridged.—Riddle's Complete Dictionary is the best of the kind in our language, and we rejoice to hear that in our principal schools it is fast superseding the compilations of Young, Ainsworth, and Adams. The abridgment is a careful condensation of the original, and contains quite enough for those students who do not aim at a critical knowledge of the Latin language. We should recommend symmetrical tables of the declensions and conjugations, as additions to the future editions of this work.

Robson's Lexicon to the New Testament.—Judiciously compiled and accurately printed.

List of New Books.—The Duke, by Mrs. Grey, 3 vols. crown 8vo. *1l.* 11*s.* 6*d.*—Methode complète de Piano, being a New and Complete Piano-Forte School, by Henry Hertz, folio, swd. 2*l.* 2*s.*—Eagle's Magistrates' Pocket Companion, 12mo. 15*s.* bds.—Spenser's Faerie Queene, new edit. royal 8vo. cl. 9*s.*—King's Interest Tables, 14th edit. 8vo. cl. 21*s.*—Kentfield on the Game of Billiards, with Rules and Regulations, and Illustrations, folio, cl. 2*l.* 2*s.*—Ince's Wonders of the World, complete in 1 vol. cl. 10*s.*—Alfred de Rosann, by G. W. M. Reynolds, 8vo. cl. 7*s.* 6*d.*—An Apology for the Cathedral Service, 8vo. cl. 8*s.*—Lord's Popular Physiology, 2nd edit. 12mo. cl. 7*s.* 6*d.*—Zumpt's Latin Grammar, 5th edit. 8vo. 10*s.* 6*d.*—The German Self-Teacher, by Henry Meidinger, 6*s.* 6*d.* bd.—Wolff's Journal of his Missionary Labours, 8vo. cl. 12*s.*—Stebbing's Sermons, Vol. I. 2nd edit. 12mo. bds. 8*s.*—Perceval's Apology for the Apostolical Succession, 16mo. bds. 6*s.*—Saturday Evening, fc. 8vo. cl. 6*s.*—Sketches in Ireland, fc. 8vo. cl. 6*s.*—M'Ivor on Versification of Homer, 8vo. cl. 5*s.*—Aliva's Edition of Murray's Introduction to French, 12mo. 3*s.* sheep.—Allen's Prayers for Private and Family Worship, 18mo. cl. 2*s.* 6*d.*—Donatt's Grammar of the German Language, 3rd edit. 1 vol. 12mo. cl. 3*s.*—Short Moral Tales for Children and Friends of Children, German and English, by W. Berger, 1 vol. 12mo. cl. 4*s.*—Documents and Dates of Modern Discoveries in the Nervous System, 8vo. bds. 5*s.*—Daguerre's History and Practice of Photogenic Drawing, 8vo. swd. 2*s.* 6*d.*—The Days of Marlborough, and other Poems, by John King, Advocate, 12mo. cl. 4*s.*—Le Tellier's French Grammar, translated for English Teaching, by Watten, 12mo. bd. 4*s.*—The Festivals of the Lord, as celebrated by the House of Israel, 18mo. cl. 2*s.* 6*d.*—Abbott's Rollo at School, 12mo. bd. 2*s.* 6*d.*—Records of Royalty, sq. 16mo. cl. 1*s.* 6*d.*—The Moravians, by the Rev. C. G. Barth, sq. 16mo. cl. 1*s.* 6*d.*—Young Crusader, by the Rev. C. G. Barth, sq. 16mo. cl. 1*s.* 6*d.*—Chick-seed without Chick-weed, 12mo. cl. 1*s.*—Tyas's Railway Map of the Environs of London, on canvas, in case, 1*s.*, paper, swd. 6*d.*

AMERICAN EXPLORING EXPEDITION.

Extract from a letter to the Secretary of the Navy, from Lieut. Wilkes, commanding the United States South Sea Surveying and Exploring Expedition, dated on board the United States sloop Vincennes, Harbour of Rio Janeiro, November 27, 1838.

I proceeded with the squadron for Madeira. We continued our cruise with light, favourable winds, without any occurrence of importance until the 6th of September, when, being near a shoal, laid down on the chart as St. Anne's shoal, I deemed it fulfilling instructions, to delay sufficiently for the purpose of examining the same; and having fully explored the locality in and near the supposed neighbourhood, by spreading the vessels of the squadron to embrace a large circumference of the ocean, nothing of it was discovered. A few hours, however, after leaving this vicinity, we fell in with a large cotton wood tree, 120 feet in length and 15 feet in circumference, which was at first reported as a shoal; and if the sea had been at all rough, it might, in passing, have been mistaken for one.

I have little doubt but similar trees have occasioned the frequent reports of vigias, or shoals, being in existence hereabouts. Our position at this time was in latitude 37° 0′ 37″ north, and longitude 40° 41′ 54″ west, and where any floating bodies drifted by the gulf stream would probably have been deposited, as there is little or no current, and that variable.

We arrived at Funchal, in the island of Madeira, on the 16th of September, after a pleasant passage of twenty-nine days. I directed a party of officers to make an excursion to Pico Ruivo, the highest point in Madeira, for the purpose of ascertaining its barometrical admeasurement, in regard to which doubts have existed, owing to a disagreement of those who have preceded us. Our observations were conducted with great care, and the barometers used were of the best manufacture of Troughton and Simms. Simultaneous observations were made at the residence of the American consul at Funchal, who was kind enough to afford us every means within his reach to facilitate our various duties.

The party remained on the summit of the mountain over four hours, which afforded us an opportunity of making a number of simultaneous observations, the result of which, in giving the height of Pico Ruivo, was as follows:—The highest point of the peak above the consul's garden was 6,181 feet. The cistern of the barometer at the garden above half tide carefully levelled, was 56.6 feet.

I feel much confidence in our result, although from the high standing of Captain Sabine, R.A., I feel some hesitation in putting it forth; but the fact of my being supported by such high authority as Dr. Bowditch and Dr. Heinekar, with whom we have differed only seventy-three feet, and one hundred and sixty-three feet, induced me to believe that some accidental error must have occurred in Capt. Sabine's observations, or that he was misled by his guides, and stopped short of the summit of the mountain, as they attempted with our party.

It appears, also, that the different results made at three separate periods, and by different persons, approaching so near each other, would be more correct than that of Capt. Sabine, who makes a difference of nearly seven hundred feet.

We made, also, a series of magnetical observations on shore for dips and intensity, and established the rates of our chronometers by a portable transit. We made by them the longitude of the consulate at Funchal, in 16° 54′ 11″ west, and found the latitude by observation to be 32° 38′ 11″ north, all which assured me that our chronometers had been performing well since our departure from the United States.

On the 25th September, having completed all that was deemed necessary, we sailed from Madeira, and stood to the southward, intending to pass over and search for the different shoals and vigias laid down on our track. After passing the latitude of the Canary Islands, we experienced a north-easterly current of about half a mile an hour until we reached the latitude of Bonavista, one of the Cape de Verds, which sets in an opposite direction to the current said to prevail between these islands, in the longitude from 19° to 21° west. We hove to, and tried the current morning and evening, and always found the same result. The current log used was two kegs, with a distance line of five fathoms between them, the lower one being just loaded sufficiently to sink the air-tight one under the surface of the water, with the usual log line attached to the centre of the distance line, precluding the possibility of its being a surface current; besides which, the dead reckoning of the ship, and our observations gave the same result. On the 29th of September we passed into coloured water, quite as green in appearance as that of fifty fathoms in depth, on soundings. On entering it, the temperature decreased one and a half degrees, and rose two degrees on leaving it. We continued in it until the 2nd of October, having run a distance of 450 miles. The vessels of the squadron repeatedly sounded with from one to three hundred fathoms of line, but no bottom was found.

The first reported shoal laid down on our route upon the charts was the Maria rock, in latitude 19° 45′ north, and longitude 20° 50′ west, which we stood for, and hove to near the position, until we had ascertained our situation correctly, by careful observations. The vessels were then spread and the course marked to run directly over the spot; the surface of the ocean visible at the time from the squadron, was not less than 60 miles in circumference, with every opportunity which the clear weather could afford, and sufficient swell of the season to have caused breakers on any shoal within 15 feet of the surface. Nothing, however, was discovered, and no bottom could be found with 300 fathoms of line.

The next position examined was Bona Felix shoal, said to be within 30 miles of Maria rock; this we searched for in the same manner, but were equally unsuccessful. We then stood for the place assigned the Bonetta shoal, to the eastward of Bonavista, said to be in latitude 16° 32′ north, and in longitude 20° 37′ west. We in like manner hunted for this, and, after exploring the locality of its position on the chart, I steered on the course of its reported bearing, east by north from Bonavista, until nearly up with the Hartwell reef, lying in sight of Bonavista, which has, without doubt, been taken for and reported as the shoal called Bonetta.

Our inquiries at St. Jago assured me that the *Mandeline* (the vessel last wrecked) was cast away on the Hartwell reef, which they have reported as the Bonetta shoal.

I am well satisfied that the positions assigned the above three shoals on the chart, and their vicinity, are free from all dangers. I am of opinion, also, that the particular and indefatigable search made by Capt. Bartholomew, of her Majesty's ship *Leven*, and the opportunities afforded me of covering, with the squadron of five vessels, so large a space, at the same time, ought to be sufficient evidence that no such dangers exist as are laid down in those positions, and should cause them to be obliterated from the charts.

From Port Praya, we steered for Patty's overfalls, as laid down in the chart, in latitude 11° north, and longitude 24° 30′ west, and had a good opportunity of examining their locality. A few rips were observed within a degree of the situation assigned them, but little or no current was found; and I feel confident in asserting that no danger exists in this vicinity, as we were becalmed in the position, and in close proximity to it for 48 hours, the squadron as usual being spread apart, and having a broad expanse of ocean under view. Owing to light contrary winds it was some days before we reached Warley's shoal, said to be in latitude 5° 4′ north, and longitude 21° 25′ west. This point was also carefully examined, but no shoal or appearance of shoal water, or any danger discovered.

Our next examination was of a French shoal, said to be (as laid down) in latitude 4° 5′ north, and longitude 20° 35′ west. This was also examined, and no danger or appearance of shoal discovered. From this point, I took advantage of the southerly wind, and proceeded east; which carried me as far as 13° of west longitude, and over the position assigned the shoal by the French hydrographers, to enable me to cross the equator eastward of the 17th degree of west longitude. We succeeded in crossing the equator in that longitude on the 5th of November, and then stood for Triton's bank, said to be in latitude 00° 32′ south, and longitude 17° 46′ west. When within a short distance of its position, the squadron hove to, for the purpose of ascertaining our position accurately; after which a course was steered nearly west. Being at the time well to the eastward, we ran on a line due east and west over it; the vessels of the

squadron being spread about three miles apart, on a line north and south. We did not, however, find it in our progress, or any bottom or indications of soundings; no *discoloration* of water was visible, or change of temperature, although the line extended 30 miles east and west of its reported position; after which we again stood to the north, and ran over a vigia as laid down on the charts, but none such was found in existence.

Our next examination was for Bonert's Sandy island, which was in like manner carefully searched after, in and around its position as laid down on the charts, but our search was equally unsuccessful. Finally, search was made in and about latitude 2° 43′ south, and longitude 20° 35′ west. Extending to the north north-west of this point a distance of thirty miles hereabouts, having been assigned as the situation of the submarine volcano reported by Admiral Krusenstern, which it was supposed might have left a shoal. This locality was twice run over in different directions, and carefully examined, with the squadron in open order, but none such was found in existence.

Lieutenant Hudson, of the Peacock, having separated from me on the 16th of October, proceeded on a different course in search of the same shoals which we were looking for, but was equally unsuccessful in finding any, as appears by the following extract from his report to me, which affords further evidence, if it were needed, of their non-existence.

"Having separated from you on the 16th of October, it was not until the 23rd that I had worked up to the Warley's shoal; and at 8 o'clock that night I was directly on the spot where it was laid down on the chart. We placed good lookouts, and kept our patent lead going for fifty miles before reaching the location of this shoal as laid down on the chart; also observing our drift at night, in hopes of sweeping over it at early daylight. I continued cruising in this vicinity in various directions, getting casts of lead in from 50 to 100 fathoms, without finding bottom. I now continued my examination, and after having swept over a circle of 40 or 50 miles in different directions, am perfectly satisfied that Warley's shoal exists nowhere in the neighbourhood laid down on the chart. I then proceeded for the French shoal with the wind ahead, (south by west,) where I arrived on the 25th of October, and continued cruising all the following day, with a fine breeze, immediately over the location of the shoal as laid down, and in every direction for miles in its vicinity. After thus thoroughly searching the *English* locality of this shoal I directed my course for the French position, seventy-six miles distant, making nearly an east course, with lookouts, and the lead going, until I had run immediately over and around the spot, sailing in various directions, a distance of forty miles, without effect. I then made the best of my way for the Triton bank, with the wind veering and hauling from south south-west, to south south-east, and passed the equator on the night of the 3rd of November, in longitude 17° 40′ west, and continued over and around the locality of that bank, until the morning of the 5th, getting casts of the lead during the time in from fifty to two hundred and fifty fathoms, up and down, without finding bottom. I have in our search, fully satisfied myself, and hope our examination will prove equally so to you, and all others, that these shoals do not exist."

Thus, sir, we have effected the examination of the supposed position of eleven shoals or dangers, which have occupied their places on the charts, much to the alarm of navigators. And I sincerely trust that the result of our endeavours and diligent search, with the exertions heretofore made by others, will be sufficient to cause them to be obliterated from the charts, as there are already real dangers sufficient to awaken the watchfulness of the navigator without his being harassed with imaginary ones.

LETTERS ON EGYPT.†

BY PRINCE PUCKLER MUSKAU.

The public attention has of late been so especially attracted towards Egypt, and the journey of the Viceroy to Fazoli,—whose principal object was certainly not the discovery of the gold mines,—has been so much talked of, (see *Athen.* ante, p. 468,) that I hope a few fragments from my own travels in that country may not be unacceptable; and as I accompanied his Highness for above a week, I can perhaps promise some more characteristic traits of Mehemet Ali, than might be contained in an elaborate portrait.

Various and sundry public journals have, I know, paid me the compliment of insinuating,—more or less broadly,—that I repay in flattery the many kind attentions shown me by that Prince. I can, nevertheless, declare, with the most perfect sincerity, that I have always regarded it as my first duty, as an author, to speak the exact truth, without respect to personal friendship or hostility; and that though I may sometimes remain silent, what I do utter will always be the expression of my own convictions. Accept, then, beloved and honoured reader, the respectful salutation with which I greet thee from the top of the highest pyramid of Jizeh. * * For the material preservation of the singular monuments which surround me, there is nothing to be feared for thousands of years to come; unless, indeed, some English antiquary, out of pure love of art, should be tempted to blow them up. We have here, at present, a most zealous amateur, who daily employs several hundred Bedouins to probe into and rummage the patient monuments in every corner. Even the Sphinx has been pierced, in order to ascertain whether it were solid, or as empty as some heads. The instruments, however, have all proved too weak—one breaks after another; and though a few fragments of stone may be scattered around, the enemy retires foiled and impotent from every attack. Harmless jesting apart, I believe the amateur in question, the gallant and amiable Col. Howard Vyse, is very likely from his acuteness and perseverance, to make important discoveries; and every stranger must feel thankful to him for having employed many of his workmen in clearing out the passages of the two great pyramids, which were almost choked with rubbish. He has found some small chambers hitherto unknown, and is in hopes of discovering a large apartment beneath the supposed royal tomb. It will, however, be better to begin my story at the beginning.

His Highness, the Viceroy, set off about fourteen days before me, for Upper Egypt, where he had the goodness to say he would wait for me. On the 21st of February I left the capital, accompanied by Dr. Koch, son of the celebrated Munich physician of that name, and surgeon to the Egyptian fleet, whom Mehemet Ali had given me as travelling Esculapius. We were both very comfortably accommodated in two good *kangshas*, assigned to me with its customary munificence by the government. My little suite consisted, besides the Doctor and his servant, of a *kavass* of the Viceroy, my dragoman Giovanni, my servant Ackermann, a Greek page from Candia, named Jannis, an Arabian cook, a little Frenchified in Cairo, and an Abyssinian female slave. The study of character afforded by this original damsel, whom civilization had as yet done nothing to spoil or to improve, was an inexhaustible source of amusement for me during the journey, and was perhaps not the less interesting, that the object of it was a most faithful copy of Titian's Venus done in black. On her entrance into my household she became, of course, free; but I fear she had no very clear idea of the state of liberty, for when I endeavoured, by the help of my interpreter, to explain it to her, she only kissed my hand, pressed it humbly to her forehead, and said softly, that I "was her lord, and might do with her as I pleased." Before leaving Jizeh we crept into one of the hot ovens, to see the eggs artificially hatched, (the reader need not fear any description of the process,) and also into another where hartshorn is manufactured. We then plunged into the sea of clover, blown into waves by a high wind, and inhabited by all the horses and asses of the neighbourhood, which at this period are turned out to grass, and, with their feet tied together, pass whole months in uninterrupted eating—one of the silliest and most injurious customs I have met with in the East.

The way appeared uncommonly long, from the deceptive effect of the pyramids as to distance. Before we left Cairo, it seemed as if we could have touched them with our hands; and yet even from Jizeh it required many hours riding to bring us to them. My eyes eagerly sought out the colossal Sphinx, which is again covered with sand up to the neck, although but a few years ago it was quite cleared. Its physiognomy is easily recognized at a distance; but on a nearer approach it becomes a formless mass. A great part of the red colour with which it was once painted, remains; but I must confess I found my highly-raised expectations rather disappointed, for I could not help thinking it looked more like a mushroom than a head. As I am about confession, I may as well also own that the Pyramids struck me as far more imposing when seen from afar, than on a closer view—the common fate of greatness. On ascending them, indeed, the grand effect was in some measure restored; but the impression on me was by no means equal, if I may be allowed a comparison, with that of Strasburg Cathedral.

It was too late to attempt any investigation on that evening, so we pitched our tents around the ruins of a pyramid long since destroyed, close to the entrance of a deep sandy valley, where stood a little solitary group of four palm trees and three sycamores. Afterwards we paid a visit to Colonel Vyse, who has established quite a little colony here, in the most habitable of the catacombs, and enclosed it within a palisade of cane. We then sunk by starlight into the arms of the kind god Morpheus, full of expectation of the things which we were to see on the morrow.

The French and Austrian consuls, and two other friends, were to have joined our party, but had all been prevented by some chance or other, so that the only companion who remained to us was an Egyptian, eighty years of age, and half blind, but still extremely active, who had spent the greater part of his life amidst the mysterious darkness of pyramids and catacombs. This strange old man never sleeps but in the open air,—a habit to which he is probably indebted for his red and swollen eyes. He dresses quite in the Arabian style, that is to say, he wears scarcely any dress at all,—merely a shirt and slippers, with a cloak in case of need. He has had his coffin made ready for some time past, and once a month takes his dinner upon it. He bears the title of Interpreter to the French Consulate, but gets his living principally by dealing in all sorts of antiques. His name is *Msarra;* but I forgot to ask him if he were a Christian or a Mussulman. In either case he is a philosopher, for he bears the troubles of this world very patiently, and has no fear of death. The grand event of his life was the accompanying General Minutoli when he went to open the great pyramid of Sakhara.

Msarra insisted that, on visiting the pyramid, we should first enter a passage discovered by him, at the end of which reposed a sarcophagus of rose-coloured granite, which he would gladly have exchanged for a much smaller weight of metal. My complaisance, however, extended only to the half of his wishes. I crawled in and out, and dislocated my limbs, to oblige him, but I made no purchase. I then left the old man at the foot of the pyramid, and began to ascend it. This is the smallest, although it appears to have been the most magnificent, of the whole group. It is formed of enormous blocks, and is still partly covered with marble; but all attempts to find the true entrance have hitherto proved fruitless. Colonel Vyse has, indeed, by immense labour, succeeded in effecting a narrow opening of about fifty-nine feet in depth; and some time ago an Arab offered, for a thousand piastres, to show the true entrance, which he declared to be known to him through an old tradition. Some hesitation was made about complying with his demand; and when at length it was determined to give what he asked, it was found that he was dead.

My own opinion certainly is, that the labour expended in this direction is thrown away; and that the remains of the personages to whose honour these monuments have been erected, are not to be sought for inside, but beneath them.

Whether the great pyramid be really, according to Champollion, the tomb of Pharao Suphis, or, according to Herodotus, that of Cheops, the two little undecorated chambers found in it, where stand the two large sarcophagi, are assuredly not the tombs of kings, but of subordinate persons, or perhaps of priests; and the monarch, whoever he may be, reposes in the spot designated by Herodotus, namely, in the very heart of the rock on which this gigantic stone tumulus was subsequently erected. I can consider as nothing more than tumuli these crude at-

† For former Letters, see *Athen.* Nos. 514, 515, 527, 529.

tempts at art, without sculpture, without hieroglyphics, which, though surrounded in the time of Herodotus with temples, sphinxes, and other magnificent works, all covered with hieroglyphics, were regarded as ancient monuments, and left with pious veneration in their original simplicity.

The hieroglyphics discovered by Colonel Vyse in the interior of the great pyramid, are not cut in the stone, but put on, as if with a finger dipped in some colour,—probably at a period comparatively recent; and it is far from impossible that the low and narrow passages, through which one can scarcely creep on one's hands and knees, so disproportioned to such enormous masses of stone, have been broken out for their own purposes by the priests long after their erection,—in the same way as we sink a shaft in a mine, or effect less systematically the openings recently made in them. The prospect from the summit of the smaller pyramid is by no means equal to that obtained from the highest of the group, but it presents the best view of the position of the many ruined pyramids which lie around. Five of the latter once stood immediately before it in a row, and three are still in tolerable preservation. The one rises in broad steps, whilst in the others, although the layers of stone retreat one from the other sufficiently to make it possible to climb up, they are much too narrow in comparison with the mass, and too irregular to present to the eye the effect of steps; and for this reason, on a near approach, have the effect merely of roughly-piled up, conical heaps of stone. The grandeur of their aspect must have been far more striking when they were covered with polished square blocks, as the top of the second pyramid still is, and thus offered immense smooth surfaces on every side; and it must have been easier to estimate their gigantic proportions by comparison with the buildings which stood near them. The labyrinthic passages into the interior are fit only for snakes and jackals; and the low mean chambers are still more disappointing.

After leaving the small pyramid, as it is called, we prepared to creep into the bowels of the great one.—The entrance, rough, but bold and colossal, like the structures of the Druids, was the only part which produced an imposing effect on me; for passages through which one must crawl, and sometimes drag oneself along, and which lead to nothing more than a few miserable little dark rooms, without a trace of writing or sculpture, or decoration of any kind, appear to me just as little objects of admiration, as the two plain stone coffins found in them for one who has beheld in Thebes some of the stately wonders of Egyptian art. These were indeed, at that time, still unknown to me, and the impression was nevertheless such as I have described.

I worked my way with my customary perseverance through every part which was open, and afterwards by means of ladders, into various holes discovered at different periods, and though this was fatiguing enough in the heat, it was not in the smallest degree dangerous, unless perhaps we except the descent of 280 feet by mere cuts in the wall, into a sort of well, which leads, from what is denominated the Queen's Hall, to the lowest passages, terminating in a rocky cavern at the very foundation of the pyramid. Out of this cavern, on the opposite side, proceeds a narrow passage which suddenly breaks off nearer to the centre; and here, perhaps, is to be sought the key to what is still unknown. Here should a diligent search be made for the lost king, who is certainly to be found here if any where, in the very heart of the rock round which, according to the father of history, once flowed the canal of the Nile. This fact, however, he gives only on the rather doubtful authority of the priests.

It was not till after several hours had elapsed that we again worked our way out of these monumental caverns, greeted once more the rosy light of day, and sank half dead with fatigue on the giant stones at the entrance, and ate oranges and drank coffee, and felt ourselves so much refreshed by this interlude that before sunset we climbed the pyramid, a height of 500 feet. I boldly led the way, and in a quarter of an hour we found ourselves comfortably landed at the top, enchanted by one of the most splendid and peculiar prospects to be seen on the earth; although consisting of only a few large masses, amongst which the rosy-tinted desert, with its fourteen pyramids, was not the least beautiful.

Since Dr. Koch was here for the first time, about four years ago, a large tract of this desert, beyond the pyramids, has been brought under cultivation, and its light sandy colour, appearing through its green covering, made it easily distinguishable from the deep black earth of the old arable land. Thus will fields and gardens again surround these monuments, as doubtless they did in former times; for though the ancient Egyptians were willing, with a fine symbolic meaning, to place their Necropolis always on the borders of the desert—the boundary of life, beyond which lay the mysterious and illimitable waste, fit emblem of death,—I do not believe that they ever willingly erected it in the midst of the sand. On the decline of civilization the memorials nearest to the sand were, of course, soonest swallowed up, like the tombs of the caliphs near Cairo, which now stand in the desert, although we know positively that they were originally placed in the midst of rich gardens and blooming orange groves.

My companions found the descent far more difficult, and creating more giddiness than the ascent. I was quite of a contrary opinion, for scrambling up steps three feet high was awkward enough, whilst jumping down them was a real pleasure for an old man like me, reminding me most agreeably of my boyish days. The whole affair is indeed such a mere trifle for any one who can use his legs, that it would be an easily won wager to climb the great pyramid twelve times in a day; and one must be more fearful than ever was old woman to see any danger in such a feat. The case is somewhat different with the second pyramid, which is within a few feet as high as that called the Great, and being on a much smaller base is of course much steeper. On reaching the top it is easy to see, from the scarcity of modern names, that its visitors have been but few. Some, however, have achieved, by means of ladders and other helps, the ascent of the topmost peak; and it is even said that a French soldier under Napoleon did so with no help but that of his own limbs; unless this were the father of Mazurier it is hard to believe the story. I myself mounted as high as any ordinary dilettanti can well do, without artificial assistance.

The interior of the second pyramid was opened by Belzoni. The passages through it are rather more commodious, and the apartments more numerous, but just as bare and unornamented as the rest, and consequently the purpose of these laboriously constructed foxes' holes, just as incomprehensible.

A court, cut in the living rock, surrounds this memorial, and the breaking up of some stones in the pavement show that there has been some attempt to penetrate beneath it.

M. Caviglia gave me an account, when I was in Cairo, of a singular discovery he had made in the vicinity of the Pyramids, of a number of apartments and passages communicating with each other, and of his having seen, at a distance of many miles in the desert, the foundations of decayed pyramids, whose granite blocks were dissolved to dust: whence he argues, that if those now standing, composed chiefly of sand-stones, be four or five thousand years old, the antiquity of those others must be four times as great.

On continuing my way through the solitary desert I could not help feeling almost angry with myself for having been struck more with the sight of many edifices of the middle ages, than with these renowned marvels of the world. The triumph of art should perhaps move us more than a mere mass, but yet even this is astonishing enough when we consider that with the materials of these pyramids it would be possible, according to exact calculation, to build a wall nine feet high and one foot thick, right across Africa, from Alexandria to the coast of Guinea.

Near the pyramids of Sakhara are some sarcophagi, much handsomer than those in the vicinity of Jizeh, and an inexhaustible succession of Ibis catacombs, and tombs of an ordinary class. My attendants were induced by a trifling reward, to open some of these plebeian mummy cases for me. But we found in them nothing more than bones like wood, and linen that had the appearance of having been burnt. We contented ourselves with contemplating from afar, the still more distant pyramids of Dashur, and then turned once more towards the beautiful valley of the Nile, and the far-stretching palm groves of ancient Memphis. The whole scene in this forest has a most striking resemblance to our northern pine-heaths, both in the form of the trees, with their long naked stems and small crowns, and in the barren sandy appearance of the soil, half covered here and there with scanty grass, and varied occasionally by a patch of boggy land, such as we find in Lusatia and elsewhere. Its appearance would therefore be just as melancholy, were it not for the sight of the majestic Nile flowing calmly along through a rich soil, bearing fruit a hundred fold, and decked with the liveliest green. Besides this, many antique ruins are found in different parts of the forest, and near the road lies the fine colossal statue of the great Rhamses (Sesostris), which down to the waist is still in perfect preservation. M. Caviglia originally made the discovery, and as all foreigners here regard the antiques as their own property, in the same way that dwellers on coasts look on the goods snatched from shipwreck, he presented it to the English Vice Consul, who is thinking of sawing off the head, and sending it to the British Museum.

I saw few fragments of any value among those which lie scattered about, but the earth must cover an infinite number, for even, in the time of Strabo, the sphinx avenue, leading to the temple of Serapis, on the opposite side of the lake which surrounds the city, was half filled up with the sand of the desert.

We gained the river with the evening twilight, riding across many small dykes, which the inundations of the Nile render necessary, and which are drawn in serpentine lines, like the walks of an English garden, to enable them better to resist the force of the water. We hastened on board the boat, which, having been kept back by contrary winds, had only just arrived from Cairo, and without loss of time began to move towards the south. At sunrise we saw in the airy distance the last of the Egyptian pyramids, rising like a golden crown over the desert. The great journey was now entered upon, which was destined, however, to a more tragical commencement than I had dreamed of.

NINTH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, AUGUST 30.

Section A.—MATHEMATICAL AND PHYSICAL SCIENCE.

The President observed, that, from the list of communications, the Section were led to expect that a paper by him would be the first submitted to their notice. He had not, however, prepared the necessary calculations, for his object had been to correct what he considered to be a mistake in the argument of Wollaston on the subject of the atomic constitution of matter; and this had been suggested to him by perceiving that M. Dumas had, in a late work, referred to and depended on this argument. As, however, M. Dumas had not arrived in time to be present at this meeting, he felt that it would be useless to prepare the calculations. He was happy, however, to inform the Section, that he had that morning received a letter from Sir John Herschel, containing a most interesting communication respecting the action of the dissevered rays of light in the solar spectrum, which he then read:—

Slough, August 28, 1839.

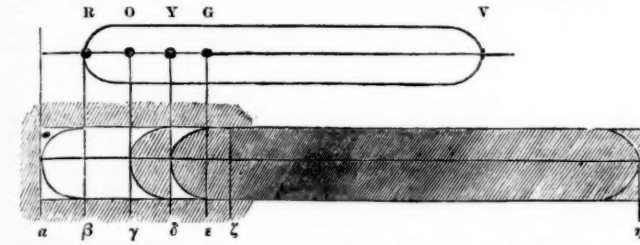
My dear Sir,—May I take the liberty of requesting that you will mention to the Physical Section of the British Association a very remarkable property of the extreme red rays of the Prismatic Spectrum, which I have been led to notice in the prosecution of my inquiries into the action of the spectrum on paper, rendered sensitive to the chemical rays by Mr. Talbot's process, or by others of my own devising.

The property in question is this:—That the extreme red rays, (such, I mean, as are insulated from the rest of the spectrum by a dark blue glass coloured by cobalt, and which are not *seen* in the spectrum unless the eye be defended by such a glass from the glare of the other colours,) not only have no tendency to darken the prepared paper, but actually exert a contrary influence, and *preserve* the whiteness of paper on which they are received, when exposed, at the same time, to the action of a dispersed light sufficient of itself to produce a considerable impression. I have long suspected this to be the case, from phenomena observed in taking photographic copies of engravings; but having at length obtained demonstrative evidence of the fact, I think this may not be an improper opportunity to announce it.

When a slip of sensitive paper is exposed to a highly concentrated spectrum, a picture of it is rapidly impressed on the paper—not merely in *black*, but in *colours*, a fact which I ascertained nearly two months ago, and which observation of mine seems to have been alluded to, (though in terms somewhat equivocal,) by M. Arago, in his account of Daguerre's process. In order to understand what follows, it will be necessary to describe the colours so depicted. The red is tolerably vivid, but is rather of a brick colour than a pure prismatic red. And what is remarkable, its termination falls materially short of the *visible* termination of the spectrum. The green is of a sombre, metallic hue, the blue

still more so, and rapidly passing into blackness. The yellow is deficient. The whole length of the chemical spectrum is not far short of double that of the luminous one, and at its more refrangible end a slight ruddy or pinkish hue begins to appear. The place of the extreme red, however, is marked by no colour, thus justifying, *so far*, the expression which M. Arago is reported to have used in speaking of my experiments—"Le rayon rouge est seul sans action."

It is impossible in this climate to form a brilliant and condensed spectrum without a good deal of dispersed light in its confines; and this light, if the exposure of the paper be prolonged, acts, of course, upon every part of its surface. The coloured picture is formed, therefore, on a ground not purely white, but rendered dusky over its whole extent, *with one remarkable exception*,—viz. in that spot where the extreme red rays fall, the whiteness of which is preserved, and becomes gradually more and more strikingly apparent, the longer the exposure and the greater the consequent general darkening of the paper.



In the figure, R V is the luminous, and α θ the chemical spectrum. Of this the portion $\alpha\gamma$ is *white*, its middle corresponding to the extreme red of the luminous spectrum; $\gamma\delta$ is red; $\delta\epsilon$ green, passing rapidly through a shade of extremely sombre blue $\epsilon\zeta$ into black, which occupies the whole space from ζ to η.

The above is not the only singular property possessed by the extreme red rays. Their action on paper already discoloured by the other rays is still more curious and extraordinary. When the spectrum is received on paper already discoloured slightly by the violet and blue rays *only*, they produce, not a white, but a red impression, which, however, I am disposed to regard as only the commencement of a process of discoloration, which would be complete if prolonged sufficiently. For I have found that if, instead of using a prism, a strong sunshine is transmitted through a combination of glasses, carefully prepared, so as to transmit absolutely no ray but that definite red at the extreme of refrangibility, a paper previously darkened by exposure under a *green* glass has its colour heightened from a sombre neutral tint to a bright red; and a specimen of paper rendered almost completely black by exposure to daylight, when exposed for some time under the same glass, assumed a rich purple hue, the rationale of which effect I am disposed to believe consists in a very slow and gradual destruction, or stripping off as it were, of layers of colour deposited or generated by the other rays, the action being quicker on the tints produced by the more refrangible rays in proportion to their refrangibilities.

It seems to me evident that a vast field is thus opened to further inquiries. A deoxidizing power has been attributed to the red rays of the spectrum, on the strength of the curious experiments of Wollaston on the discoloration of tincture of guaiacum, which ought to be repeated; but in the sensitive papers, and still more in Daguerre's marvellous loduretted silver, we have re-agents so delicate and manageable, that everything may be expected from their application.

J. F. W. HERSCHEL.

P.S.—I enclose a picture of the spectrum, formed as above described. It must be viewed by lamp or candle light—NOT BEING FIXED. In this way it may be examined by any number of persons, which by daylight would be impracticable, as a few minutes exposure would obliterate all its peculiar characters. The larger pencil dot indicates the centre of the sun's image, formed by the extreme red rays, at which point the maximum of *whiteness* will be observed to occur.

At the close of the letter, the piece of photogenic paper, discoloured, and impressed as it were with the solar spectrum, was exhibited to the Section.

The President observed, that this communication of Sir John's contained the germ of a series of discoveries, for it now appeared, that the action of some of the rays most materially affected and modified the actions which others exerted, insomuch that some of them actually prevented the effect that others would produce, instead of there being, as was heretofore supposed, only one series of discolorations for all the rays.—Dr. Daubeny admitted the value of the discoveries just announced. He then expressed a hope that the President would reconsider his determination of not making the communication which had been announced in his name. It was a subject in which he felt an interest, from having read the recent work of M. Dumas.—Prof. Whewell replied, that, if time permitted, he would endeavour to collect his thoughts on the subject, and comply with the wishes of Dr. Daubeny.

'On the effects of Lightning in three of Her Majesty's Ships,' by Mr. Snow Harris.—Mr. Harris recalled the attention of the Section to the Experimental Exposition he had brought before the Association at Liverpool, relating to the best method of defending ships from lightning; since that time, he had been engaged in collecting information on this subject. The present instances were illustrative of the protecting effect of metallic bodies, when properly applied along the masts, against the damage usually sustained by shipping, when dense discharges of electricity fell on the masts. In the diagram presented to the Section, the conditions under which the three ships had been struck by lightning were pointed out. The cases alluded to comprised two sloops of war and a schooner—viz. the *Athol* and *Hyacinth*, of 28 guns each, and the *Buzzard*, of 10 guns. The *Athol*, by a peculiarity of her rig, had chains for hoisting the topsails, chain slings for the lower yards, and chain sheets for the topsail wheel on deck. The other vessels had only chains leading to the deck from the lower yards, but not chains above. The *Athol*, it appears, having her topsails on the caps, received no damage of consequence after the lightning had reached the chain tye, the top-gallant and royal masts only being shivered. In the latter cases, the topmasts were destroyed also, the lower masts being protected in a similar way to the former. The *Hyacinth* lost both fore and main topmasts. The electric agency found its way safely over the chain cable forward, and through the copper pipe of a pump abaft leading out under water through the side of the ship. The facts were authenticated by officers who were in the ships. The author conceived it was only by examining facts of this kind that we could hope to obtain practical information on this subject: thus in the present case it is observable, that a flash of lightning which shivered in pieces a royal-mast and topmast, had been safely transmitted, by a small iron chain and a copper pipe of about one inch and a half in diameter, and one-eighth of an inch thick, which furnished some information as to the probable effects of atmospheric electricity on lightning conductors. Mr. Harris proceeded to show, from these phenomena, that were the masts of ships made perfectly good conductors of electricity, and freely connected, by efficient conductors, with the sea, then the electrical agency would have an unlimited and easy source of diffusion in all directions, and hence the ship would be safe from the moment the flash struck the mast-head. He had lately been collecting instances of damage by lightning in the British Navy, and had deduced some results not unworthy of notice. It appeared, in 100 cases of ships struck by lightning, that the number struck on the main-mast were to those struck on the fore-mast as 2 : 1; to those struck on the mizen-mast, as 10 : 1; to those struck on the bowsprit, as 50 : 1. About one ship in six is set fire to, in some part of the hull, sails, or rigging. In one-half the cases, some of the crew were either killed or wounded. In the 100 cases alluded to, 62 seamen were killed, and about 114 wounded. These were exclusive of one case of a frigate, in which nearly all the crew perished, and of 12 cases in which the numbers killed or wounded were set down in the accounts given, as several or many. In these 100 cases, there were damaged or destroyed 93 lower masts, principally line of battle ships' and frigates', 83 topmasts, 60 top-gallant masts.

Prof. Stevelly stated that he had been almost an eye-witness to a case very similar to those Mr. Harris had brought under notice. When he was delivering a lecture on Astronomy at the Royal Institution in Cork in 1829, a thunder-storm came on, and a ship's mast, within a few hundred yards of the room in which he was sitting, was struck, and the entire mast, to within about five feet of the deck, shivered into small fragments, about eight or ten inches long, and as thick as a person's finger. What saved the lower part of the mast was, that the iron pump handle came near it at the place the ravage ceased: the lightning glanced off along it to the pump iron, and so into the water.—Prof. Forbes observed, that a collection of facts such as Mr. Harris had begun, was of more importance to a maritime state like ours, than most persons were aware of. He conceived, that experiments might, with much benefit, be undertaken, to establish the fact whether chains or straps of metal would afford the best protection to ships, and in what manner they should be put on, so as to afford the greater security. He was convinced accidents were constantly occurring at sea from this cause, which no person ever heard of—the entire crew, perhaps, perishing between the two awful elements to which they became exposed after the ship had been set on fire. The case of the New York packet which had been struck and set on fire by lightning, was a recent example of the importance of the investigation he was advocating. He had seen the compasses of that vessel after she had been struck; most of them had their poles completely reversed; so that, in this case, the danger to which the ship and passengers were subjected was of a very mixed nature.—In confirmation of what had been said by Profs. Stevelly and Forbes, Mr. Harris mentioned two instances in which masses of wood struck by lightning, without apparent damage externally, but which, nevertheless, had been set on fire within the substance, and had burst into a flame, a long time after the accident. This happened on board a Neapolitan line-of-battle ship, in the Mediterranean. The ship had returned from sea, and anchored, after having been recently struck by lightning; all of a sudden, the mast burst out into a flame. The author considers, that many of the Liverpool and American traders which have been within a few years either wholly or partially destroyed by fire, after being struck by lightning, have suffered from the electric agency having produced a similar result on the substance of the cargo. He thought the consequences of the action of electricity might, with very little trouble, be effectually prevented.

The Secretary then read a 'Notice of determination of the Arc of Longitude between the Observatories of Armagh and Dublin,' which had been received from Dr. Robinson. At the Edinburgh meeting, a Committee was appointed to determine, by chronometers or signals, or both, the longitudes of the principal observatories of the British Isles; and its members were authorized to apply to the government for any aid that might be necessary. Cambridge and Oxford present no peculiar difficulties; but the observatories of Ireland and Scotland, both from distance and local circumstances, were less easily managed. The chronometric part of the process has, however, been most effectually performed by one of our members, Mr. Dent, who, in the first instance, sent twelve of his chronometers from Greenwich to Edinburgh and Makerstoun, (the observatory of Sir T. M. Brisbane). They were returned again to Greenwich, and Prof. Henderson has deduced from the results—

Longitude of Edinburgh	+12^m 42^s.99
Makerstoun ..	+10 3. 66

These were reported by Sir T. Brisbane at the Newcastle meeting (*Athen.* No. 568), and they inspired Sir W. Hamilton and myself with the desire of obtaining a similar determination of our longitudes. Mr. Dent not merely placed these chronometers at our disposal, with three additional ones, but gave his personal attendance and assistance—an advantage which could not have been purchased, but which I mention as an instance of the aids which these meetings afford to science. Twelve of the chronometers were rated, as before, at Greenwich Observatory, three others at the Marine School; and Mr. Dent, setting out on the evening of September 20, 1838, was enabled, by the rapidity of railroad travelling, to compare them at Dublin on the morning of the 22nd, and on that of the following day at Armagh, having travelled about 500 miles. The return was effected with equal rapidity; and I have deduced from the comparison—

Longitude of Dublin	+25^m 21^s.08
Armagh	+26 35 .44

which, however, cannot be regarded as definitive,

until the personal equations of the Irish observers shall have been compared with those of Greenwich. The extreme consistency of the individual results—the greatest difference being 1ˢ.65—is well calculated to inspire confidence; and there is every reason to rest satisfied with these numbers as the chronometric longitudes. Yet however accurate they may be, it is impossible to consider the means by which they are obtained as superseding the method by signals. The first transports the time from one station to another by machines, which, though their performance is wonderful, yet must be disturbed by that very process. In the second, the chronometer is *light*. Its application is far more costly, as well as difficult, but its certainty is greater, and the whole of the disturbing causes are in view. The general character of it is this: the flame of gunpowder at an intermediate station is observed from the observatories, and the difference of the times is that of the longitudes. If the interval is too great for one signal, two, with an intermediate observer, are employed. The eastern signal is observed by him, and by the eastern observatory; and a short time after, he observes the western signal, in conjunction with the western observatory; and the longitude is the difference of observatory times, lessened by that which has elapsed between the two signals. Thus, any number of intermediate stations may be employed. The powder is generally fired on mountains; and it is found, that the flash of small quantities is visible at very great distances: that of four ounces has been seen at 140 miles. Where mountains are not to be found, the requisite height must be gained by rockets; and an elegant application of this is seen in Sir J. Herschel's operations for determining the relative longitude of Greenwich and Paris, detailed in the Philosophical Transactions for 1826. This kind of signals is essential in Ireland; and even with them, the local circumstances of Armagh are such as to present great difficulties. A range of hills rises to the south, from 600 to 1000 feet above it, at about four miles distance; and these are shut out from Dublin by high ground to the north of it. I was deprived of the aid of Col. Colby, by his absence in Scotland, where he was engaged in making the necessary arrangements for the completion of its survey; but my friend, Lieut. Larcom, supplied all necessary information; guided by which, the mountain Slieve Guillen was selected; its summit is visible from Dublin, 52 miles; but is 800 feet below the land which bounds my view. This decided the size of rocket necessary; as, besides certainly clearing that ridge, they were to carry four ounces of powder, the two-pounder is necessary for this; and, on stating my objects, a liberal supply of them was ordered by the Board of Ordnance, together with tents for the firing party—and, indeed, whatever I required was freely afforded. Without dwelling on details, it may be sufficient to mention, that on four nights in last May, notwithstanding most unfavourable weather, we obtained, from seventy-four signals, forty-two good results, from which we deduced our difference of meridians to be 1ᵐ 14ˢ.425, only three-hundredths of a second greater than Mr. Dent's chronometers had given.—In taking this mean, it is necessary to attend to the different value of the work of each night, which varies according to the number of signals observed, and that of the stars observed for time. This has been done according to the theory of probabilities; in applying which it was found, that the *probable* error of time, determinable by a star, is about 0ˢ.065, and by a rocket, 0ˢ.16. It also appears, that where several intermediate stations are used, the value of the result is rapidly diminished; so that, for example, if, as in Sir J. Herschel's operations between Greenwich and Paris, we suppose three stations, ten signals at each, and seven stars to determine time at the extremities, the *worth* of such a result is but 0.38 of what it would be if the work could be done by one signal station. If to this we add the great uncertainty of perfect transmission along the line, it becomes an object to increase the extent of distance commanded by each signal as much as possible. To complete the work, it is necessary to know the personal equation of the observers, or, in language fit for the *uninitiated*, the difference of the times at which two observers estimate the passage of a star over a transit wire; such a difference, as astronomers well know, almost always exists, and sometimes to a startling extent. By a journey to Dublin, my assistant determined that he observed 0ˢ.167 earlier than the other, and therefore the true difference of longitude is 1ᵐ 14ˢ.258.

It is our intention next to determine the longitude of the third great Irish Observatory—that which Mr. Cooper is furnishing with instruments of unexampled magnitude and power, which can be connected by one station with this and Dublin simultaneously. *That* I hope to follow up by a similar operation between Armagh and Edinburgh, if, as I hope, the Board of Ordnance prove as propitious to my second application. Rockets of sufficient power, fired on Goatfell, in Arran, can be seen from these observatories, distant 105 and 85 miles; they must, however, rise 1,100 yards, while those used by me ascended from 600 to 800 yards only; but this is a range quite within reach of Woolwich Pyrotechny. Several which I lately made, not exceeding two pounds, rose, with the same heading, from 1,200 to 1,300 yards; and, judging from the range of English war-rockets, *their* ascent would be even greater. If *they* be supplied, it would be an object of no common interest to see the instrument of carnage and terror devoted to the ministry of science. The flash of powder can be seen at even greater distances than those named, but its flame is far less brilliant than many other pyrotechnic compositions, some of which I find are twice as luminous. If this succeed, the junction of Dublin with Oxford, by signals on the Welsh Mountains, is not more difficult, and perhaps even that of Greenwich and Paris by a single station is not impossible. T. R. Robinson.

'Account of a recent successful Experiment to determine, by means of Chronometers, the difference of Longitude between Greenwich and New York,' by E. J. Dent.—The rapid transmission of chronometers now practicable by means of steam-vessels from one meridian to another, offers great facilities for the determination of the differences of longitude. This led me (said Mr. Dent) to embark four chronometers on board the *British Queen* steam-vessel, on her first voyage from England to America. Captain Roberts, the commander of the vessel, kindly undertook the charge of them, and (through the interest of Messrs. E. and G. W. Blunt, of New York), Jesse Hoyt, Esq., the collector of the port, gave a free permit, as well as every other facility, for landing them. They were then compared daily with two astronomical clocks at the observatory at Brooklyn, 4,700 feet, or 3ˢ.09 east of the City Hall, in New York. The errors of these clocks were determined by transit observations on the days of arrival and departure. The errors of the clock with which the chronometers were compared at Greenwich immediately before the embarkation on board the *British Queen*, and also immediately after their landing at Greenwich from that vessel on their return, were determined by means of several series of zenith distances of stars on both sides of the meridian, and also of the sun, taken with a sixteen-inch altitude and azimuth instrument at the Royal Naval Schools, Greenwich, by the Rev. George Fisher. The stone pedestal, on which this instrument was placed, is, by actual measurement, 560 feet, or 0ˢ.6 west of the transit instrument at the Royal Observatory, which quantity is, of course, applied to determine the Greenwich error. In determining the difference of longitude in the present case, I use the methods which I employed, first, in my journey for the same object between Greenwich and Paris, and subsequently, in the other experiments which I have made to determine the difference of longitude between Greenwich and Oxford, Dublin, Armagh, Edinburgh, Cambridge, &c. The first method is by means of the *travelling rate*, the second is by the *stationary rate*.* The "travelling rate" is the mean rate during the voyage, obtained by dividing the difference between the previous and subsequent errors at Greenwich, by the number of days absent. The "stationary rate" is a mean of the rates determined, 1st, at Greenwich, before the chronometers were embarked; 2nd, at Brooklyn, after their disembarkation there; and 3rd, at Greenwich, on their return after their landing. The first method is, no doubt, the more unexceptionable of the two; it involves, indeed, the supposition of the *outward-bound rates* being the *same* as the *homeward-bound ones*; yet as errors, arising from the magnetic action of the iron in the vessel upon the chronometers, or other causes, would, in all probability, be an excess and defect to the same amount, we might, therefore, reasonably expect a compensation of errors to occur, or nearly so. It is very remarkable, that on board the steam-vessel in *all* the chronometers, the *mean* "*travelling rate*" differs from the *mean* "*stationary rate*" *in the same way*, or the *losing* rates were increased, and the *gaining* ones diminished. Whether, however, we use the travelling rate or the stationary rate for the determination of the difference of longitude of the two places, we obtain results extremely near to each other, provided we take the means between the *outward* and the *homeward-bound* determinations. This was shown by calculations submitted to the Section. Taking the first result, or that given by the *travelling rate*, as the true difference of longitude between the Observatories of Brooklyn and Greenwich, and applying the quantity, 3ˢ.09, for the difference of meridians between the Observatory of Brooklyn and the City Hall, in New York, we have for the difference of longitude between the latter place and Greenwich 4ʰ 56ᵐ 3ˢ.35 west. The longitude of New York from Paris, as given in the *Connaissance des Tems*, by M. Daussy, is 5ʰ 5ᵐ 22ˢ.0: if from this be deducted 9ᵐ 21ˢ.28, the difference of longitude between Greenwich and Paris, as determined by the chronometrical experiments made by me between those two places in 1837, we shall have 4ʰ 56ᵐ 0ˢ.72 as the difference of longitude, according to that observer, between Greenwich and New York.

Comparison of results.

	h.	m.	s.
First, by the chronometers, the longitude of New York is west from Greenwich	4	56	3.35
Second, by M. Daussy, as given in the Connaissance des Tems	4	56	0.72
Difference.....			2.63

This difference is less than three-fourths of a mile in longitude; and the smallness of it proves, that this, the first result by the transit of chronometer, from England to America, removes the apprehensions that have been entertained of chronometers not going well in steam-vessels.

Captain Johnson observed that chronometrical measurements, for the determination of longitudes were of great importance, but as curious differences were known to occur (even when the observations were made with great care), it was very essential to know all the conditions under which such measurements were made, with a view to discover the cause of such differences; and therefore he begged to ask Mr. Dent how and where the chronometers were placed on board the ship, especially with respect to the line of the keel, and whether the ship's local attraction had been determined?—Mr. Dent stated that the chronometers were deposited in the captain's cabin, which was in the afterpart of the vessel, and about midway between the vertical plane of the keel and the ship's side. That he was not aware that the local attraction of the vessel had been determined, but that he took some precautions to neutralize the action it might have on the chronometers. These consisted principally in placing the *arm* of the compensation balance, when at rest, at right angles with the keel, assuming that the local attraction was, most probably, strongest in that direction. As the balance arm would, from this position, vibrate an equal number of degrees on each side of this line of greatest attraction, the deranging effect of the attraction, in consequence of any polarity in the arm, would be neutralized. That the ordinary custom of placing chronometers, when magnetic effects are to be observed, by the hour figures of the dial plate, without attention to the relative position they may have to the *balance arm*, is imperfect; that this relative position should always be ascertained before placing the chronometer, and a memorandum made of it.

A note, by Mr. Dent, accompanying a table of the rate of the Transit clock in the Observatory, Oxford, was then read, (being an addendum to Mr. Dent's paper on pendulums, presented at Newcastle, *Athen.* No. 566.)—In 1838 a transit clock was made by Messrs. Arnold & Dent for the Observatory, Oxford, to which, by the special desire of the late Professor Rigaud, was attached the improved mercurial pendulum with its cistern of cast iron, &c. In the statement now submitted of the going of this

* These have been sometimes called the "shore rates" and the "ship rates."

clock will be found, said Mr. Dent, a mean daily rate, which, when corrected for an *intentional* over-compensation, rarely equalled the amount of the correction; for this over-compensation is, I think, for many reasons, a subject for experiment alone: I conceive it cannot be calculated but with extreme difficulty—1st, because the centre of oscillation must be disturbed, and then an additional correction becomes necessary, in consequence of the alteration in the pendulum-rod, to bring it to time; 2nd, because some quantity is due to the change of elasticity produced by extremes of temperature in the suspension spring; and 3rd, because another quantity is due to that effect of extreme cold which is indicated by a decrease in the vibration arc of the pendulum. In the present case, the reduction of compensation required is so small, that until some cause for stopping the clock occurs, Professor Johnson is not anxious that the compensation shall be attempted.

The following is the monthly abstract of the mean daily rate of the transit clock, as observed by the Savilian Professor of Astronomy.

	Daily Rate. sec.	Therm. deg.
1838, October	−0.136	50.14
,, November	−0.511	44.18
,, December	−0.987	41.47
1839, January	−0.887	38.45
,, February	−0.544	42.29
,, March	−0.414	41.18
,, April	−0.060	55.57
,, May	+0.016	55.38
,, June	+0.222	62.57
,, July	+0.375	65.00
,, August	+0.223	64.53

The President then said, that as one or two papers had been withdrawn, he would proceed to make some remarks on Dr. Wollaston's argument respecting the infinite divisibility of matter, drawn from the finite extent of the atmosphere.—He observed, that Dr. Wollaston had proceeded on this supposition: that if the extent of the earth's atmosphere be finite, air must consist of indivisible atoms; since, as he assumed, the only way in which we can conceive an upper surface of the atmosphere is, by conceiving an upper stratum of atoms, the weight of which, acting downwards, is balanced by the repulsive force of the inferior strata acting upwards.—Mr. Whewell maintained, that such a mode of conception was altogether arbitrary, and the argument founded upon it quite baseless; for if we investigate the relation between the height of any point in the atmosphere, and the density of the air at that point, upon the supposition that the compressing force is as the nth power of the density, we find that the density vanishes at a finite height whenever n is greater than unity. Therefore, though the atmosphere do not consist of indivisible particles, it will still have a finite surface. In fact, the finite surface of the atmosphere no more proves the atomic constitution of air, than the finite surface of water, in a vessel, proves the atomic constitution of water. But it will still be asked, how then is the highest stratum of air supported? To which the answer is, that there is no highest stratum of definite thickness. Supposing the atmosphere finite, every upper stratum of air bounded by the upper surface of the atmosphere, has the upper part of that stratum supported by the lower; and, however thin it be, it has still an upper and a lower part which have this relation to each other. The question, What supports the *uppermost* stratum of the atmosphere? is of the same kind as the question formerly discussed by writers on mechanics, What is the velocity with which a body *begins* to fall?

Professor Stevelly said that perhaps this question would be more familiar to many persons if the scientific language of the President were made more popular, by explaining, that the real question was, whether matter was so constituted as to be infinitely divisible? or consisted of molecules or atoms, which could not be farther divided, *de facto* at least; for in imagination any portion of extension, however small, can be farther subdivided. This latter, Wollaston produced strong probable reasons for considering as the true statement; his argument from astronomy was, that if matter were capable of indefinite subdivision, the atmosphere would be indefinitely extended, and then the moon and planets would, each, in the lapse of time, have collected atmospheres from ours, bearing to one another the proportions of their power of attraction; this was not the case, as astronomy proved: for instance, the density of the atmosphere of the moon was not the 2000th part of that of the earth, at their respective surfaces. The earth's atmosphere then did not even extend, in space, as far the moon.—Dr. Daubeny said he was sorry to find, that the doctrine of atoms, which on chemical grounds, he considered as probable, had been deprived, by the President, of the support which the memoir of Dr. Wollaston had seemed to afford if. He had been disposed to think more favourably of that argument, from finding that M. Dumas had resorted to a very paradoxical supposition in order to reconcile the conclusions of Wollaston, which he admitted, with the doctrine of the infinite divisibility of matter, which he also maintained. M. Dumas, in his work 'Sur la Philosophie chimique,' maintains, that a limit would be assigned to the extent of our atmosphere in consequence, merely, of the extreme cold of the upper regions, by which the air would be condensed into a solid form. Hence, according to him, the boundary of the atmosphere would consist of a sort of *crystalline sphere*, such as what the ancients had imagined, but with this difference, that the celestial luminaries, according to Dumas's views, would lie beyond this sphere, whereas Ptolemy supposed them to be included within it. Leaving it for opticians to decide how far such a palpable medium could interfere with the transmission of light and heat from without, Dr. Daubeny contended, that the temperature which Fourier had assigned to the celestial spaces was too high to allow of the solidification of oxygen and nitrogen gases, which indeed had been found to resist a degree of artificial cold greatly inferior to this, as, for instance, that produced by solid carbonic acid. But though he could not agree with Dumas in this particular point, he was quite ready to bear his testimony to the general merits of his work, and in particular, to point out the satisfactory manner in which he has shown, that matter cannot be separated into its ultimate particles, either by physical or by chemical means; but that elastic bodies consist of *groups of atoms* mutually repulsive, and that chemical combination takes place between smaller groups indeed of the same, but not between individual atoms.

Mr. Parsey then read a paper 'On Natural Perspective,' a subject which he has frequently explained by lectures, and on which he has published a work, to which those interested in the subject can refer.

We here insert, at the request of a correspondent, a description of the Compound Pendulum, described by Mr. Frodsham, and referred to *ante*, p. 674.

It is an ordinary pendulum, with a steel rod, over which Mr. Frodsham slips a zinc tube, which passes through a brass bob, and rests on the adjusting screw at the lower end of the rod, the bob being fastened at the centre by two connecting rods of steel to the tube, at the point at which the expansion of the tube is the same as that of the rod; so that, as the steel rod expands downwards, and is lengthened by heat, the zinc tube expands upwards in the same degree; and therefore, if the lengths of the rod and the tube be rightly proportioned, the pendulum may be regarded as of invariable length. But, as it is seldom found that different specimens of the same metal have precisely the same expansibility, Mr. Frodsham proposes to have several small pieces, or rings of different lengths, cut from the same tube, as correcting pieces, which are to be slipped on or withdrawn, until the length of tube is found that will compensate the pendulum for change of temperature. Mr. Frodsham stated, that the hole in the bob through which the zinc tube passes, is larger than the tube, but there are brass fillets at both ends, with a hole in each exactly fitting the tube; these fillets are perforated with several small holes to admit the air, so that any change of temperature may not be prevented from affecting the part of the tube which is within the bob. The zinc tube is larger than the steel-rod of the pendulum, fillets being also placed at each end of the tube, with a hole in each, just large enough to let the rod pass through. The tube is pierced with small holes throughout its whole length, to allow the air access to the rod. In the suspending part of the pendulum, Mr. Frodsham directed attention to what he called an isochronal piece; it is a brass tube about five inches in length, with a slit about an inch in length at the bottom, to form a spring, so as to slide rather stiffly on the rod. At the upper end of the tube is a clasp, which, by means of two screws, is made to embrace the suspending spring; so that after the pendulum has been adjusted to the length for time, the acting part of the suspending spring may be varied at pleasure, without altering the length of the pendulum, by sliding the isochronal piece up or down the rod, and tightening the screws of the clip. Previously to tightening the screws of the clip, the suspending spring must be allowed to assume its natural and unconstrained position. The rod and the spring being thus united, there can be no wavering motion of the rod, such as is generally found, in a greater or less degree, when the rod and the spring are simply pinned together. Instead of the fork which embraces the pendulum, and connects it with the clock, being a fixture, Mr. Frodsham uses a rod about eighteen inches long, attached to the pallets of the clock, and on this rod is slid a moveable fork, which is fastened by a screw to the rod, at such distance from the axis of the pallets, as is found by experiment to have the greatest power over the pendulum, and thereby cause it to vibrate through the largest arc. Mr. Frodsham stated that by a series of experiments, he had discovered that to any given weight of the bob of a pendulum, some particular length and strength of the suspending spring is better adapted than any other to produce isochronism, and with such spring the pendulum will vibrate through a larger arc with a given weight, or will vibrate as far with a less weight than with any other, and that, unless the pendulum is first isochronized, anomalies may be imputed to imperfect compensation, which have their origin in a very different source.

Section B.—Chemistry and Mineralogy.

SATURDAY.

'Researches on the Electrical Currents on Metalliferous Veins made in the mine Himmelsfurst, near Freyberg,' by Professor Reich.

Since Mr. Fox first discovered the fact in copper mines in Cornwall, it has been known, that an electrical current is indicated by Schweigger's multiplier, when two points, where ore presents itself, are connected by a metallic wire, whether these be in the same or different veins. Mr. Fox repeated the experiments in lead veins, with similar results. On the other hand, Von Strombeck (Karsten's Archiv. VI. p. 431) could find no trace of such electrical currents in lead and copper veins on the right bank of the Rhine; again, Henwood repeated the experiments in Cornwall, and confirmed the results of Fox. Prof. Reich has made similar experiments in the mine Himmelsfurst, which lead to very decisive fundamental results. The method of experiment was in the main that of Fox. When the two points to be connected were determined, a fresh surface was first worked on each, and on this a disc of copper 6 inches long 3 inches wide was kept firmly pressed by a piece of wood. An uncovered end of a copper wire, spun over with silk, was kept pressed to the copper plate by means of a clamp. The one wire was always short, the other, about 180 metres long, was rolled on a reel. This latter was retained in all the experiments, the current having thus the same length of wire to pass, so that its influence on the amount of deviation of the needle was constant. The long wire was let out till it reached to the second point of contact, near which the multiplier was placed, and the two ends of the fine wires connected with it. The multiplier, with double needle, and very sensible, belonged to a thermo-electric apparatus of Melloni, made by Oertling of Berlin. In order, in some measure, to judge of its delicacy it may be mentioned, that a current, from a pair of zinc and copper plates of only one inch square, placed in water very weakly acidulated, drove the needle up to the button, placed at 90°, to prevent further deviation; that an iron wire connected with two brass wires, placed in the multiplier, by the mere heating with the hand of the point of contact, produced a deviation of from 10° to 20°, according to the temperature communicated. The following results were obtained:—1. Two ore points, separated by a non-metalliferous mass, or between which there occurs a cross vein, or the vein is worked out, give rise to an electric current in a metallic wire connecting them. This law was determined by seventeen experiments, with every

variety in them, so as to obviate all objections. 2. Two ore points in uninterrupted metallic connection with one another induce no electrical current through a wire connecting them. 3. If only one disc be connected with an ore point, and the other with the timbering, or be held in the hand, there is no effect produced on the multiplier. This result was confirmed several times. 4. If an ore point be connected with masses of ore already won, a current sometimes manifests itself, and sometimes there is none. 5. When an ore point is connected with non-metalliferous rock, frequently no current takes place; frequently, however, a current, always feeble, occurs in the connecting wire. This result does not agree with that of Fox and Henwood, who never detected a current. Professor Reich performed the experiment eighteen times, and always obtained the same result. 6. With respect to the cause of the electrical currents, observed in metalliferous veins, three different opinions have been broached. They have been ascribed, 1, to general electric currents at the earth's surface, produced either entirely or in part by the earth's magnetism: 2, to hydro-electric, and 3, to thermo-electric actions of the various metallic components of the vein. The first hypothesis, according to Reich, is refuted by the independence of the direction of the currents on their position relatively to the earth's axis. Thermo-magnetism Reich holds incapable of producing such strong currents: as the strongest currents are observed exactly where the two points were separated by a non-metallic conductor. Reich concludes that there remains only the hydro-electric action of the metallic components of the vein to account for the phenomena. 7. In respect to the extent of the deviation of the multiplier, it is to be borne in mind, that there can be no immediate conclusion drawn from this as to the electric difference of the substances coming into play, for it depends on the resistance to conduction in the entire circuit, which again depends on the dimension and nature of the intervening rock, as also on the more or less perfect contact between the copper disc and the ore, and between the disc and the wire.

It was observed by some members that a discrepancy appeared to exist between the results of Mr. Pattinson and Professor Reich. It is possible, however, that this may be explained by the circumstances of the experiment of the former according to the conclusion No. 5. of Professor Reich, and also by the less delicacy of the galvanometer of Mr. Pattinson.

'On the Relations of Atoms in Organic Compounds,' by T. Exley.

This paper constituted an extension of the author's application of his theory to organic compounds. His theory is briefly as follows:—there are three kinds of atoms, 1, atoms of common matter, of which chemistry has discovered 55 kinds. The author terms them tenacious atoms. 2. The second kind comprises such as are concerned in electrical phenomena, and may be called electrical atoms; they have much smaller absolute forces than those of the former class, but larger spheres of repulsion. 3. The third class consists of ethereal matter or atoms; these have their forces very much less than the preceding, but still larger spheres of repulsion, although they differ by small degrees from each other, which give various sorts in this class as well as in the first. The volume of a gas is not altered by a certain difference in the absolute force or sphere of repulsion of the atoms, but, the pressure and temperature being given, depends entirely on the number; for, by increasing the force or atomic weight, we equally increase the attracting and repelling force, and an alteration in the sphere of repulsion is supplied by an alteration in the ethereal matter present. The same is true of single groups, that is, of groups such, that the centres of all the atoms in them are within or on the surface of repulsion of one of them, for such groups are surrounded by single atmospheres, and the action is the same as on a simple atom, since it serves only as a point of support for the pressure. However many volumes are thus united, the result can be only one volume; thus, 3 volumes, viz. 2 of hydrogen and 1 of oxygen, make 1 vol. of olefiant gas; 6 vols., viz. 4 hydrogen and 2 carbon, make 1 of etherine; also 24 vols., viz. 16 hydrogen and 8 carbon, make 1 of cetine. A double group consists of 2 atoms, or of 2 single groups connected by an atom, or by a single group or groups. This always makes 2 vols. exactly when in a gaseous form, for the distance between the extreme atoms, or single groups, will not be altered by the connecting atom or atoms, how many soever there be, since they only perform the office of the ethereal matter displaced by them, because as much as they increase the tendency of the extremes towards each other by their attractions on them, just so much they diminish that tendency by their attractions on the ethereal matter, which acts against their approach. This theoretical result is also established by experiment as much as any deduction from theory can be. Not a single established exception is to be met with. Thus, there are upwards of 20 substances known, in which two atoms or volumes, united by a third, make exactly two volumes, and more than 30, in which 2 simple atoms are connected by a group of 2, 3, &c., atoms; and more than 100, in which two single groups are connected by a third, and in every case the result, without exception, is two volumes; for the specific gravity, calculated from the theory, agrees with that obtained by experiment. Alcohol is 9 vols. in 2, ether 15 in 2, urethan 13 in 2, oxalic ether 20 in 2, succinic ether 26 in 2; and there is no exception. There is a third kind of chemical union, which the author terms cohesive, as muriatic acid. It occurs when the electric atoms of one element are brought between both, and form the connecting link, instead of the intermediate group in preceding cases. Such atoms as with difficulty receive or part with the electric fluid, have the nature of acids, and belong to those which have been called electro-negative; those which readily receive and yield the electro-fluid are alkalescent, and rank with those called electro-positive; and in this is found the reason of their tendency to unite, which may be increased or diminished by electricity. Among solids, salts are of the class, and often light has considerable effect in their crystallizations. The author proceeded to instance several organic compounds which support his view. Many of these, according to him, consist of water and olefiant gas. These are H_2O and H_2C, or represented in the order of their arrangements, H(O)H and HCH,—the former denoting a double group, the latter a single; but water in the liquid state would be HOH. Pyroxylic spirit is a compound of these, and might be $H(H_2O)CH$, or $H(H_2C)OH$; but the former is the true representative, as appears from many other compounds which have the same extremes. Apply heat to a mixture of pyroxylic spirit 1 part, common salt 2 parts, and sulphuric acid 3 parts, and chloride of methylene is obtained. Thus we have—

$$\left\{\begin{array}{l}(H(H_2O)CH, \text{ pyroxylic spirit,}\\ (Cl\,Na,\ SO_3, \text{ salt and sulphuric acid.}\end{array}\right.$$

One portion of sulphuric acid decomposes the salt, and muriatic acid is formed, which takes the place of the connecting water, removed by another portion of the sulphuric acid, and thus we have H(Cl H)CH = chloride of methylene. The specific gravity is 1.770 by calculation, and 1.736 by experiment. By distilling 1 part pyroxylic spirit with 4 concentrated sulphuric acid, hydrate of methylene is obtained, having the same elements and specific gravity as alcohol. Thus we have—

$$\left.\begin{array}{l}H(H_2O)CH\\ H(H_2O)CH\end{array}\right\} \text{Pyroxylic spirit.}$$
$$SO_3 \qquad \text{Acid.}$$

During the reaction, besides other effects, the sulphuric acid withdraws the connecting water from $H(H_2O)CH$, by which it throws the extremes H and CH together, which become HCH, and combines with H_2O, the connecting link in another adjacent atom of the spirit, and thus we have $H(H_2C,H_2O)CH$. The following substances have their extremes doubled:

1. Pyroxylic spirit.... $H(H_2O)CH$
2. Alcohol ..... $H_2C(H_2O)CH_2$
3. Ether..... $H_4C_2(H_2O)C_2H_4$
4. Valerianic acid .... $H_8C_4(C_2O_3H_2)C_4H_8$
5. Ethal ..... $H_{16}C_8(H_2O)C_8H_{16}$
6. Sulpho-acetic acid.. $H_{32}C_{16}(SO_3H_2O)C_{16}H_{32}$
7. Stearine..... $H_{64}C_{32}(C_3H_6CO)C_{32}H_{64}$

There are at least ten substances whose extremes are the same as No. 1, thirty-three the same as No. 2, and nineteen the same as No. 3. Of the others only a few have as yet been discovered, and the specific gravities of these in the gaseous form, by calculation, agrees with experiment. If we take the instance of œnanthic ether, which is = 2 atoms etherine, united by one of hydrous œnanthic acid, $= H_4C_2(H_{28}C_{14}O_3)C_2H_4$; the number of its elements is 57, and insulated make 57 vols.; but here two exactly, for the sum of the atomic weights, is 300, and therefore, 150 to a volume. Now, $150 \times \frac{1.0}{14.4} = 10.416$ specific gravity, and Liebig found it 10.508 by experiment; and such is constantly the correspondence in the results. The author affirms that this is utterly repugnant to the theory of solid atoms in contact; and "perhaps it was for this reason," observes he, "that Dr. Dalton said, at the Bristol Meeting, that he had never fully received Gay-Lussac's theory of volumes, for till then he had never seen a reason for it."

'On the relative Combinations of the Constituents of Cast Iron, Steel, and Malleable Iron,' by Dr. Charles Schafhaeutl, of Munich.

The author showed, that the purest carbon contained and retained hydrogen, and sometimes azote, even at the highest temperatures, and parted with neither of them, nor were its own internal and external properties altered, except when it attacked the crucible, and combined instead with oxygen, or aluminum, or silicon. He affirmed, that we possessed no certain method of procuring pure carbon in the isolated state, and that what we considered to be pure carbon was always, more or less, in the state of *carburet*. The author described a new method of obtaining graphite—viz. by running fluid puddling slag, or silicates of iron and manganese, over fragments of pit coal. After cooling, the surface of the slag is always found to be altered, and to be covered with a very easily separable layer of graphite, not only where the slag actually touches the coal, but even where it comes in contact with the smoke evolved from the coal. The formation of graphite commences at a temperature lower than 1500° Fahr., and reaches its highest point not much exceeding 2000°. Two different sorts of graphite were produced in this way; one, which he marked graphite (A), was in elastic scales, of the thickness of writing paper, with a rather dull metallic appearance. The graphite marked (B) was of the thickness of gold leaf, and extremely light and unctuous to the touch. He found, that all sorts of graphite lost their unctuosity and bright appearance by exposing them to the action of concentrated hydro-fluoric acid gas. Graphite (B) was found to consist of—

Protoxide of iron..	18.6000
Silica	7.6200

probably mechanically, but equally and invisibly intermixed with—

Carbon	70.3421
Silicon	3.0744
Loss	00.3635
	100.0000

Graphite (A) gave—

4.93 Silicon.
9.50 Iron.
85.45 Carbon.
00.12 Loss.

100.00

The quantity of oxides of iron and silica had been ascertained by heating the specimens first with acids and caustic leys; the quantity of carbon, by burning the specimens with chromate of lead and chlorate of potash; and the silicon, by melting the powders with carbonate of soda in a platinum crucible. He considered, therefore, the graphite to be a *carburet of silicon* and iron; and showed, by heating in a *peculiar way* the remainders, left after the solution of iron in chlorohydric acid of a certain specific gravity, that the chemical composition of cast iron, in its two distinct species of gray and white cast iron, had direct relation to the two specimens of graphite, and in all probability was derived from similar origin, as indicated in the following table:—

Graphite (B).		*Gray Cast Iron.*	
Iron, Silicon	Oxygen. Silicate of iron.	Iron, Silicon (Aluminum)	Silicet and aluminet of iron.
Silicon, Carbon	Carburet of silicon.	Carbon, Silicon	Carburet of iron.

Graphite (A).		*White Cast Iron.*	
Iron Carbon	Carburet of iron.	Iron Carbon Azote	Carburet of iron.
Carbon Silicon	Carburet of silicon.	Silicon Carbon	Carburet of silicon.

It was further shown, that all gray iron, produced by heated air as well as by cold air, left a grayish white residue behind after treating it with chlorohydric acid of a certain specific gravity. This remainder, acted upon with caustic ammonia, evolved very rapidly pure hydrogen gas, and alumina afterwards was found in the solution with a little silica. The presence of aluminum in its metallic state, after having been treated with acid, as well as the absence of all *azote*, seemed to be one principal feature *of gray iron of France* as well as of England; as, on the contrary, carbon, hydrogen, and *azote* are always present in the remainders of *white iron*, which remainders appear invariably of a brownish colour; and that azote was a constituent of steel as well as of wrought iron. Further, it was explained, that silicon generally was combined with *carbon*, and dissolved in the carburets of iron, and that it was extremely difficult to produce an alloy of iron with silicon alone, without the presence of a little carbon, aluminum, and other similar bodies. He found the molecules of all iron of a similar form, belonging to the cubical system, and the largest not exceeding 0.0000633 of an inch in diameter, and that particularly upon the arrangement of these molecules depends, in a great measure, the different appearance of the different kinds. He denied that any graphite scales were to be seen in gray cast iron; yet, that under a magnifying glass what appeared to the naked eye graphite scales, were really surfaces and planes of crystallization, composed of pentagonal planes not wider in the smallest diameter than 0.000355 of an inch, and composed of the before-mentioned smallest or primitive iron molecules. According to his statement, the molecules of the iron are arranged in the gray cast iron in the most regular form, having all their surfaces in one plane; the most equal distribution of molecules appeared in hardened steel; collecting in fascicular aggregation in soft steel, and being loose and longitudinally arranged in wrought iron. He stated that pure iron could not be welded; that the welding power of iron depended on its alloy with the carburet of silicon, and also that the good and various qualities of all the wrought irons depended on the alloys of pure iron with other metallic bodies; and that the presence of most of the electro-negative metals had been generally overlooked in the existing analysis of iron. The presence of arsenic in Swedish steel, when forged red hot, could be ascertained by its smell, as well as in the Low Moor iron. The usual solution of iron under analysis, in order to separate those metals from the iron, must be, for the necessary correction, divided into two parts,—one to be treated with a current of sulphuretted hydrogen, the other part *dropped* into sulphydrate of ammonia, and carefully digested. A small quantity of silica was more difficult to separate from a large quantity of iron than generally seemed to be believed; and the real amount of carbon could *only* be ascertained by Berzelius's method of burning iron in a current of oxygen, or mixed with chlorate of potash and chromate of lead in a glass tube, used first by Berzelius for analysis of organic bodies. The author maintained that steel was an entirely mechanical production of the forge hammer, which tore the molecules of certain species of white cast iron out of their original position, into which the forces of attraction, in respect to the centres as well as to the position of the molecules, had arranged those molecules by the slow action of heat. Steel, as it came out of the converting furnace or the crucible, was nothing more or less than white cast iron, of which Indian steel, called Wootz, was the fairest specimen. The author finally gave an analysis of two specimens of cast iron and one of steel. The first specimen was French gray iron, from Vienne, Department de l'Isere, obtained from a mixture of pea-iron-ore with red hematite, by means of coal from Rive de Gier and heated air, specific gravity 6.898. The second iron was Welsh iron, from the tin-plate manufactory of the Maesteg Ironworks, near Neath, in South Wales, obtained from a mixture of clay iron-stone and Cumberland red ore, by means of coke and heated air. It was silvery white, without signs of crystallization: specific gravity 7.467. The third specimen was a fragment of a razor forged in the author's presence, in the workshop of Mr. Rodgers, of Sheffield, of the specific gravity of 7.92.

	Gray French Iron.	White Welsh Iron.	Steel.
Silicon	4.86430	1.00867	0.52043
Aluminum	1.00738	0.08571	0.00000
Manganese	0.75130	traces.	1.92000
Arsenic	0.00000	0.00000	0.93400
Antimony	0.00000	1.59710	0.12100
Tin	0.00000	0.00000	traces.
Phosphorus	0.54000	0.08553	0.00000
Sulphur	0.17740	0.32018	1.00200
Azote	0.00000	0.76371	0.18310
Carbon	3.38000	4.30000	1.42800
Iron	89.00740	91.52282	93.79765
Loss	00.27222	00.31428	0.09382
	100.00000	100.00000	100.00000

Several gentlemen, among whom were some connected with the iron trade, expressed a high sense of the value of this communication, from which it appeared that the peculiarities of Swedish iron, in a great degree, depended on the presence of arsenic, and those of Russian iron on the presence of phosphorus.

Section C.—GEOLOGY AND GEOGRAPHY.

SATURDAY.

At this hurried meeting, a report was read by Mr. Owen; and a paper from Mr. R. Garner 'On the use of Millstone Grit in the manufacture of White Earthenware.'—Millstone grit has been used in Staffordshire for three or four years, being ground instead of flint, which is more expensive, having to be calcined before grinding. The ware thus produced is as white, compact, and durable, as that made by the former process. The proportions used in its composition are about equal parts of the mill-stone grit and of Dorset and Cornish clay. The grit requires to be selected, and to be as free as possible from iron and sulphate of barytes: the best quality consists of particles of quartz with some feldspar.

Section D.—ZOOLOGY AND BOTANY.

SATURDAY.

Some remarks were made on the introduction of a species of Auchenia into Britain, for the purpose of obtaining wool, by Mr. W. Danson. Samples and manufactured specimens of Alpaca wool, in imitation of silk (and without dye), as black as jet, were exhibited; and Mr. Danson stated, that the animals producing it ought to be propagated in England, Ireland, Scotland, and Wales; and to the two latter places the Alpaca is well suited, being an inhabitant of the Cordilleras, or mountainous district in Peru. Importations have already taken place to the extent of one million of pounds, and are likely to increase. There are five species of Llamas, of which the Alpaca has fine wool, six to twelve inches long, as shown by the specimens exhibited, the Llamas, the hair of which is very coarse, and the "Vicuña," which has a very short fine wool, more of the beaver cast. The Earl of Derby has propagated the Alpaca in his private menagerie at Knowsley, and Mr. Danson understood that Mr. Stephenson, at Oban, in Scotland, has a few of these animals. The wool of these animals would not enter into competition with the wool of the sheep, but rather with silk. It is capable of the finest manufacture, and is specially suited to the fine shawl trade of Paisley, Glasgow, &c. The yarns spun from it are already sent to France in large quantities, at from 6*s.* to 12*s.* 6*d.* per pound, the price of the raw Alpaca wool being now 2*s.* and 2*s.* 6*d.* per pound.

Mr. Vigors stated, that one of the objects of the Zoological Society of London was, to introduce animals which might be made available for draught, food, or clothing. Amongst others, this animal had been kept in the Society's Gardens. They bred and looked well, but were subject to disease, which was the case with most foreign animals at first. Animals were generally found adapted to the districts in which they lived, as the camel, &c., but animals which afforded food and clothing are usually capable of universal dispersion, as the horse, sheep, &c. He believed, that in the course of time the Llamas referred to would be acclimated amongst us. These animals also brought forth their young at an unseasonable period, Christmas; but in general animals changed their season of bringing forth, in order to adapt it to the climate they lived in.

Prof. Jones made some observations on an apparatus for observing fish (especially of the family Salmonidæ) in confinement. He stated, that he had been last year appointed one of a Committee of the British Association to inquire into the habits of the Salmonidæ. He had lately been in Scotland, and, although he had no communication with his colleagues on this subject, he would give the result of his inquiries. The points to which attention is required to be directed are the following:—1st, The salmon, the grilse, and the sea-trout, leaving the sea in the autumn, for the purpose of depositing their spawn in rivers, it is desirable to determine whether these are so many distinct varieties, or the same fish in different stages of its growth. 2nd, With regard to the whiting (*Scottice*, Herling), it is not positively known by fishermen whether it spawns at all, or is merely a young fish, which must undergo a further change before it becomes capable of reproduction. 3rd, The fry, or young fish, in their first descent from the rivers, exhibit certain differences of appearance; but those differences are not such as enable the fishermen to determine the kind or variety (if any) to which the young fish respectively belong. 4th, With regard to the par, or brandling, the questions are, whether it is an adult fish *sui generis*, or the young of some variety, or the ordinary fry, in an early stage of its developement. These questions are important, as the decrease of the British fisheries is very great; and, by settling them, such provisions might be made by the legislature as would not only obviate further diminution, but restore the fisheries to their former abundance. A model of an apparatus was here exhibited, in which it was proposed to confine the fish, in order that observations might be made upon them in their various stages of growth, provision being made for the admission of sea and fresh-water, according to the quantity supposed to be required by the fish in their natural state. Mr. Jones then read a letter from Mr. Relph, who had been more than fifty years in the salmon fishery. "In May, 1819," he says, "there were 1,700 fry marked at Kings-gate Fishery, near Carlisle, and in the July and August following a quantity of whitings, or herling, were taken, coming from the salt-water, bearing the same marks. These marks were made by cutting away the fin called the dead fin, just above the tail. In September, 1821, a grilse was caught bearing the mark, and weighing 7 pounds 6 ounces; so that from the time it was marked its average growth had been one ounce per week. There were also several salmon taken bearing the mark, and weighing from 10 to 16 pounds."

Mr. C. C. Babington made a verbal communication concerning some recent additions to the English Flora. 1. He stated, that *Medicago apiculata*, Willd., which he suspected might be only a variety of *M. denticulata*, had been found near Brighton, and at Salcombe, in Devonshire. 2. *Arthrolobium ebracteatum*, Desv., was stated, on the authority of Miss White, to be a native of the Scilly Isles. 3. *Myriophyllum alterniflorum*, D.C., in Shropshire, where it was discovered by Mr. Bloxam, and in Sussex, according to Mr. Borrer. 4. *Callitriche platycarpa*, Kutz, common in England. 5. *Hypochæris balbisii*, Loisel, which is only, in his opinion, a variety of *H. glabra*, has occurred in Shropshire and Kent. 6. *Hieracium pelliterianum*, D.C., which is probably a variety of *H. pilosella*, grows upon the Breidden Mountain, in Montgomeryshire. 7. *Senecio erraticus*, Bert., common in Cornwall. 8. *Orobanche barbata*, Reich, upon ivy in many places. 9. *Scrophularia balbisii*, Hornem. This has been confounded with *S. aquatica*, but appears to be much the more common species in England. 10. *Allium sibericum*, Willd., upon the sea cliffs near Tintagel, and between Kynance Cove and the Soap-rock at the Lizard, both in Cornwall. Very nearly allied to *A. schænoprasum*, and perhaps only a very large variety. 11. *Iris tuberosa*, Linn., considered as a native in some hedge banks near Penzance; but Mr. Borrer and Mr. Babington believe it to be only an escape from cultivation. 12. *Nasturtium anceps*, Reich, common. 13. *Cardamine sylvatica*, Link., common. These two are considered varieties respectively of *N. sylvestre* and *C. hirsuta*, by many people. 14. *Sinapis cheiranthus*, Roch: sands near to Penard Castle, near Swansea. 15. *Polygala oxyptera*, Reich. This plant, which is probably only a variety of *P. vulgaris*, is common in

Devon and Cornwall. 16. *Dianthus plumarius*, Linn., common on old castles. 17. *Spergula vulgaris*, Reich. Only a variety of *S. arvensis*. Common. 18. *Stellaria umbrosa*, Reich. Maresfield, Sussex. Attention was drawn to this plant by Mr. Woods, who considers it as a distinct species. It is very nearly allied to *S. media*. 19. *Hypericum linarifolium*, Vahl. Cape Cornwall. 20. *Oxalis stricta*, Linn. Considered by Mr. Penneck, of Penzance, to be a native of Cornwall, but only found as a weed in some gardens near Penzance.

Mr. Forbes thought our present manuals were too limited, and that the species and varieties of British plants required more investigation.

A letter was read from Mr. Garner, on the *Beroe pileus*, stating, that he had not seen in this animal true luminosity, but only a peculiar luminosity in the dark. The external rows of ciliæ he believed might produce it. He had remarked, that if only one of the ciliæ were removed from this animal, it still continued to vibrate for many hours. He thought the currents in Beroe might be accounted for by ciliæ, which he observed to be placed in the whole of the interior of the animal. In the interior of the animal he had observed what appeared to him to be sacculi.

Mr. Forbes thought the two last facts were new in the history of this animal.—Mr. Patterson had seen two ciliæ vibrate for forty-eight hours after removal from the Beroe.

Mr. Lankester made a communication on some specimens of the White Bream. Amongst the fish taken at Campsall, is one resembling the White Bream (*Abramis blicca*). These fish vary very much, and do not agree with the descriptions given by Mr. Yarrell; and certain distinctions were pointed out by Mr. Lankester.

Section F.—STATISTICS.

THURSDAY.

Mr. Wharton made a report on the progress of the inquiries made by the Committee instituted at the meeting of the British Association in Newcastle, when the sum of 50*l.* was placed at the disposal of Mr. Cargill, Mr. Wharton, Mr. Buddle, Mr. Forster, Mr. Wilson, and Mr. Johnston, for the purpose of making inquiries into the Statistics of the Mining Districts of Northumberland, Durham, and Yorkshire.

In order to render the information collected on this subject more complete, and to give it—however imperfect it may for some time be—the character of at least *a part of a whole*—the Committee proposed to arrange the inquiries under the three heads of Mining, Manufacturing, and Moral. The Committee had not experienced that readiness among the owners of mines to supply information which had been anticipated: from one large establishment they received a peremptory refusal to answer their queries, and an intimation that all persons connected with it were forbidden to communicate with the Committee. They had, however, obtained the statistics of the colliery and village of Hetton. A few extracts from this single return will be sufficient to explain the nature of the inquiry.

What is the general appearance of the village—the locality—the cleanliness—width and drainage of the streets?—Hetton Colliery workmen's dwellings form about 5 villages; about 6 miles east of Durham; generally clean; streets from 7 to 11 yards wide, properly drained.

How many rooms does each house usually contain?—The pitmen's houses are two rooms, and two rooms and attic.

What is the size of the rooms in general?—Some 15 and others 16 feet square.

Are there any instances in which brothers and sisters sleep in the same bed? How many? Of what ages?—Yes, under 9 years of age there are instances, but not of older.

Are there any instances in which a whole family, or more families than one, sleep in the same room? How many?—In about six instances a whole family sleep in the same room, but in no instance does more than one family.

How many houses have gardens attached to them?—All.

Are they ornamental gardens, or otherwise—of what size?—Many are ornamental; others vegetable; about 240 square yards.

Are pigs, poultry, &c., generally kept?—Yes.

What number are receiving instruction in schools?—1,281 children receive instruction in schools.

How many schools are there in the village?—Fifteen.

How many children above five years of age are able to read and write?—Forty in every hundred.

How many adults out of one hundred, taken at random, are able to read or write?—Forty-eight in every hundred.

How many places of worship are there in the village, and of what sects?—Ten—Established Church, Wesleyans, Primitive Methodists, Baptists, and Wesleyan Seceders.

What may the average attendance at each place of worship be estimated at?—Church 380; Wesleyans 426; Primitive Methodists 370; Baptists 150; Wesleyan Seceders 14.

Do the boys learn the use of carpenters' tools so as to be able to make or mend their own furniture?—Not at school—many pitmen have acquired a good knowledge of the use of carpenters' tools, and make their own furniture.

What is the average rate of wages earned by the able-bodied workmen, specifying the different classes—hewers, putters, banksmen, masons, miners, washers, smelters, &c.?—Hewers 3*s.* 9*d.*, putters 3*s.* 9*d.*, banksmen 4*s.* 7*d.*, waggonmen 3*s.* 6*d.*, enginemen 3*s.* 4*d.*, masons 3*s.* 5*d.*, smiths 3*s.* 2*d.* per day, with house, firing, and garden in addition; the hewers for six, and all the others for twelve hours per day.

What are the average earnings of boys? Of girls?—Boys about 16 years of age 2*s.* 3*d.* per day; no girls employed.

What is the average age at which boys and girls go to work above and under ground?—Boys 9 years; no girls employed.

Are boys and girls more generally employed now than formerly?—Boys not more; girls less than formerly, none being now employed, whereas twenty years ago they were.

What strikes have occurred during the last ten years?—Two; commencing 5th April 1831, and 5th April 1832.

What has been the duration of each?—One two months, and the other five and a half months.

What the objects, and how far successful?—Increased wages, but they did not succeed.

General observations on the salubrity of the village, and the longevity of the inhabitants.—The villages are healthy, and many of the inhabitants live to the age of 84 or 85 years.

What diseases are most prevalent? Do they arise from the work in the mines?—Asthma is the most prevalent disease, arising partly from working in the mines, but only in half-broken constitutions.

Mr. Clarke read a paper 'On the Commercial Statistics of Birmingham, prepared by a Local Committee.'—This paper includes returns from the Savings' Bank, the Assay Office, the Workhouse, and the Assessed Tax Office, with a return of the steam power employed in the borough; and two others on the occupations and weekly wages of mechanics. The savings' bank report showed the satisfactory progress of this institution. It was established in 1827, and at the close of that year 980 accounts had been opened, and 33 closed, 2,337 deposits were made, to the amount of 10,612*l.*; the average of each deposit was 4*l.* 10*s.* 9*d.*, and of each account 10*l.* 16*s.* 9*d.*, and the number of depositors 935. At the close of 1838, 1,597 accounts had been opened during that year, and 454 closed; 9,136 deposits entered on the books, amounting to 47,362*l.*; the average of each deposit was 4*l.* 17*s.* 4*d.*, and of each account 17*l.* 17*s.*, and the total number of depositors 7,446. The amount of silver marked at the Assay Office, from its establishment in 1774, has been 4,011,997 ounces; and the weight of gold marked from the year 1825, when an act was passed authorizing the assaying of gold manufactures, has been 27,167 ounces. The total amount of duty received is 105,851*l.* A curious fact was mentioned in this return; 25,000 gold wedding rings were assayed and marked at this office in last year. The workhouse return was complete for 19 years, and exhibited a classified report of the expenditure, with the average number of paupers, the proceeds of their labour, &c. The return of assessed taxes showed the amount collected in each year from 1817, and exhibited a very satisfactory improvement in the state of the town. The total amount of taxes collected in 1816 was about 36,000*l.*, and the sum paid in 1838, if calculated at the same rate, would have been considerably more than 50,000*l.* The steam power employed in Birmingham is at the present time 3,436 horses power, of which 2,155 horses power is employed in the metal trades of the town. The number of steam engines is 240, of which 65 are high pressure, and the remainder condensing engines. In the first 35 years after the introduction of steam power, only 42 engines were set to work; in the next 15 years 78 were erected, and in the last 8 years 120 have been established. The consumption of coal is estimated at 240 tons per day, and the number of persons employed at 5,200 males and 1,762 females. The return of occupations comprised 791 members of a Provident Institution, who were divided among no less than 110 different branches of trade, thus demonstrating the division of labour to an extent far beyond the calculation of political economists. Of the whole number, 56 per cent. were workers in the metals. The table of weekly wages showed the result of an inquiry into 662 cases, of which 479 were taken without choice from the members of the Provident Institution, mentioned in the last return. The averages were as follows: for boys 7 to 13 years of age 3*s.* 1*d.*, and for girls 2*s.* 4*d.* per week; from 14 to 20 years, 5*s.* 9*d.* for males, and 5*s.* 2*d.* for females; for men and women 24*s.* 3*d.*, and 8*s.* per week. Reasons were assigned for the belief that these averages might be taken as a near approximation to the average wages of Birmingham mechanics.

Professor Powell read a paper 'On Academic Statistics, showing the proportion of Students in the University of Oxford who proceed on to degrees.'

University of Oxford.

Year.	Number Matriculated.	Passed Examination.	Obtained honours.			Obtained degrees.					
			Classical honours.	Mathem. honours.	Both.	B.A.	M.A.	In Civil Law (ordinary).	Ditto (honorary).	Medicine.	Divinity.
1831	387	279	107	22	15	228	178	9	6	2	16
1832	377	275	104	21	17	269	175	5	8 [B. Assoc.]	1	11
1833	384	291	135	25	16	292	186	4	1	8	13
1834	360	292	120	21	15	304	207	11	76 [Installation]	7	16
1835	369	292	105	22	8	272	173	20	6	5	1
1836	369	275	121	28	20	298	200	7	1	6	21
1837	421	261	124	24	18	246	161	6	1	2	14
1838	393	274	105	24	10	264	181	13	1	10	12
Mean	382	279	115	23	15	271	183	9		5	13

On these data we may observe:—

1. The proportion of those who enter different professions cannot be estimated. The degrees in Civil Law are only taken either for practising in Doctors Commons, or by the statutes of particular colleges. Those in Divinity, chiefly by those who have preferment in the church; while the great body of those who take orders have only the degrees of B.A. or M.A. In Medicine alone can the proportion be estimated: which is to those who pass the examination in Arts (a necessary preliminary) as 1: 55.8.

2. The difference between the number who are matriculated and those who pass the examination, is occasioned, 1st, by those who fail in the examination; 2nd, those who, from various causes, do not remain in the University: such as being directly or indirectly sent away on account of irregular conduct, &c. The ratio of this difference to the number who pass, or of irregular to regular men, will be found 1: 2.67.

3. The mathematical honours (which imply all degrees of attainment in mathematical science, from the highest to a knowledge of somewhat more than the mere letter of four books of Euclid) form the only public test of any cultivation of science in the University. The proportion, then, of those who evince any, even the smallest, knowledge of science, to those who pass the examination, is 1: 12.

Mr. Fripp then read the 'Report of the Committee appointed to inquire into the condition of the Working Classes in the city of Bristol.'—At the meeting of the Association in Liverpool in 1837, said Mr. Fripp, I submitted the abstract of an inquiry into the condition of 275 families of the working classes of Bristol. The results of a similar inquiry on a more extended scale, into the state of the working classes of some towns of Lancashire, were at the same time communicated to the Section; and as it seemed very desirable to carry on the investigation which had been commenced in Bristol, as well as in other places, a grant was made by the Council of the Association for the furtherance of these inquiries, on the express condition that they were to be made the subject of communication to this Section as to their numerical results only. On the strength of this grant, and aided by some private contributions, the inquiry into the condition of the working classes of Bristol has been since carried on, and I now lay before the Section a complete analysis of its results. The in-

vestigation was made personally by the agent of the Bristol Statistical Society, and in the mode which was formerly detailed to this Section. [The report then went into matters of detail, for the particulars of which we cannot find room.]

Analysis of the Inquiry into the condition of the Working Classes in the city of Bristol.

Number of Houses examined (containing)			3,028
Families (consisting of)	per ho. 1.97		5,981
Persons (of whom are)	per ho. 6.84 / per fam. 3.46		20,717
Heads of Families with or without children:			
Men .. Married	3,880		
Single or Widowers	703	4,583	
Women Married	3,880		
Single or Widows	1,398	5,278	
Children .. Boys	5,363		
Girls	5,493	10,856	
(2.82 per fam.)			20,717
Nation .. English	5,220		
Irish	501		
Welsh	170		
Scotch	15	5,906	
French	5		
Italian	6		
Dutch	5		
German	5		
Prussian	2		
Swiss	1		
East and West Indian	2		
American	1	27	
Not ascertained		48	5,981
Families having children		3,846	
not having children		2,135	5,981
occupying airy apartments		3,569	
apartments close and confined		2,412	5,981
Families consisting of			
Single persons (unmarried, widows, or widowers)		1,163	
Two persons		1,298	
Three persons		990	
Four persons		792	
Five persons		691	
Six persons		470	
Seven persons		269	
Eight or more persons		308	5,981
Families occupying part of a room only		556	
One room only		2,244	
Two rooms only		1,439	
Three or more rooms		1,742	5,981
Families having sufficient cupboards or shelves		3,688	
some, but deficient		1,421	
without any		872	5,981
Families having religious books (Bible and Pr. Bk. only, or both)	3,430		
having other books or tracts, or parts of some	947	4,377	
not having any books or tracts (including 2 not ascertained)		1,604	5,981
Families having prints of some kind on the walls		3,030	
not having any		2,938	
not ascertained		13	5,981
Families clean and respectable		3,610	
dirty and disreputable		1,095	
in considerable distress		660	
condition not ascertained		616	5,981
Heads of Families depositors in savings' banks, or members of benefit societies or trade clubs		940	
Not depositors, nor belonging to any benefit society, &c.		4,973	
Not ascertained		68	5,981
Heads of Families who can read and write (more or less.)		5,122	
only read		2,523	
Total who can read		7,645	
unable to read or write		2,204	
not ascertained		12	
(Men 4,583, Women 5,278)			9,861
Men who can use carpenters' tools so as to mend their own furniture (on their own statement)		2,703	
who cannot use tools		1,880	4,583
Women who can sew and wash		5,156	
(of whom can also knit 297)			
who cannot sew or wash		122	5,278
Rents, &c.			
Families renting house or apartments from owners		3,298	
tenants		2,666	
occupying their own houses		13	
apartments free		4	5,981

Average rent paid by		£. s. d.	
1,799 Families, for 1 room unfurnished,		0 1 3½	per wk.
4		free.	—
943 .. .. 2 rooms ..		0 1 11¾	—
790 .. .. 3 rooms		0 2 5¼	—
632 .. .. 1 room furnished		0 2 0¾	—
10 .. .. 2 rooms		0 2 10½	—
1,156 .. .. houses (under 20*l.*)		9 9 8	per ann.
59 .. .. .. (20*l.* and above).			
588 .. not ascertained.			
5,981			
			per ann.
Of the houses the lowest rent was		3 0 0	
the av. rent of 47 not exceeding 5*l.* was		4 10 9	
561 above 5*l.* & under 10*l.*		7 17 11	
(therefore) .. 608 below 10*l.* ..		7 12 9	
548 of 10*l.* and below 20*l.*		12 5 3	
Rent 20*l.* and above 59			
1,215			

Children, &c.	Boys.	Girls.	
Of the age of 1 year and under ..	398	443	
2 years	411	457	
3 years	339	366	
4 years	333	338	
5 years	304	313	
6 years	247	265	
7 years	338	276	
8 years	237	279	
9 years	274	279	
10 years	276	264	
11 years	206	218	
12 years	278	258	
13 years	209	210	
14 years	294	233	
Above 14 years ..	1,219	1,294	
	5,363 +	5,493 =	10,856
Of whom are healthy		10,085	
unhealthy (1-14th)		771	10,856
Children above 7 years old, sleeping in same room with parents, or both sexes in same room		4,752	
Children brought up to trade or useful occupations		2,687	
not so brought-up (above 14 years old)		731	3,418
Girls who can sew and wash		1,702	
sew only		1,350	
cannot sew, wash, or knit (old enough)		74	
too young, or not accounted for ..		2,367	5,493
Children at School:			
Not above 3 years of age	120		
From 3 to 14 years old	3,394		
Above 14 years old	222		
		3,736	
Children not at School:			
Not above 3 years of age	2,294		
From 3 to 14 years old	2,535		
Above 14 years old	2,291		
		7,120	10,856
Children stated by their parents to be able to read and write	2,010		
able to read only	3,934		
		5,944	
unable to read or write—			
under 7 years of age ..	3,603		
above	1,309		
		4,912	10,856
Children able to repeat the Lord's prayer ..		6,504	
not able, or too young		4,352	10,856
Payments by Scholars:			
Gratis (chiefly Sunday scholars)		1,425	
At 0*s.* 0½*d.* per week		6	
0 1 —		715	
0 1½ —		181	
0 2 —		650	
0 3 —		397	
0 4 —		165	
0 5 —		3	
0 6 —		85	
0 7 —		14	
0 8 —		36	
0 9 to 1*s.*		27	
Paid for by friends		11	
Not ascertained		21	
			3,736
Religious Profession.			
Church of England		4,547	
Roman Catholics		489	
Methodists		223	
Dissenters (other)		589	
Jews		5	
Without any profession		81	
Not ascertained		47	
Heads of Families			5,981
Bodily Complaints.			
Cripples		18	
Spinal deformities and accidents ..		24	
Paralytic, Fits, Vitus's Dance, &c.		48	
Dumb		6	
Blind		12	
Idiots and Insane		21	
			129

*Small Pox.**		
Natural Pox	1,632	
Vaccinated	3,535	
Inoculated	93	
Neither	1,102	
		6,362
Caught Small Pox after Vaccination	..	17
Houses.		
With drains or sewers	2,398	
Without drains, or stopped	630	3,028
With privies	2,451	
Without, or very bad	577	3,028
With a good supply of water	1,724	
Without, or very bad or deficient	1,304	3,028

Mr. Clark then read 'Contributions to the Medical Statistics of Birmingham,' by a Local Committee; comprising elaborate returns from the Town Infirmary, the General Hospital, the General Dispensary, and the Eye Infirmary; and also a return from the Superintendant Registrar of the Births, Marriages, and Deaths during the last two years.—The medical institutions are of two different kinds, the first being a parochial infirmary for the relief of paupers, and the others being supported by subscriptions. The returns from the infirmary were confined to the parish of Birmingham, there being none received from Edgbaston and Aston. They comprised,—1st, A return of the number of in-patients for the last seven years; 2nd, A return of the number of out-patients relieved in each quarter, for ten years, with the number who have received pecuniary relief; 3rd, Returns of the occupations and diseases of 9172 males, and 8774 females, out-patients; and, 4th, A return of the age, sex, and disease of 1518 cases of death among the out-patients. The returns from the General Hospital comprised,—1st, A return of 6133 cases, with the sex, disease, and mortality; 2nd, A return of the number of in-patients and out-patients, and the amount of subscriptions received from the commencement, with the annual expenditure for the last ten years; and, 3rd, Four returns, showing the nature of the fractures in 943 cases occurring in the last two years, and statements of the results of the cases of paralysis, scirrhous, and joint diseases, which had occurred in the same period. The returns from the General Dispensary comprised the number of medical and midwifery cases, and of vaccinations, with the expenditure for the last ten years. It appeared that, during that period, 29,713 persons had received medical relief, 7,892 midwifery cases were attended, and 26,089 children vaccinated, at the cost of 13,105*l.* 1*s.* 3*d.*; giving an average of 4*s.* 9*d.* as the cost of the sick and midwifery cases. The returns from the Eye Infirmary of Mr. Richard Middlemore, gave,—1st. The number, sex, and cost of the patients, from 1824, to March 1839; 2nd, The number of patients attended, from March 1828 to March 1835, with the diseases from which they suffered; and 3rd, A return of Mr. Middlemore's patients for the year ending March 1839, giving the disease, sex, age, employment, and colour of the eyes of each patient, and likewise the result of treatment. The total number of patients reported is 23,554, and the expenditure 2,161*l.*; making the average cost of each case 1*s.* 9*d.* With reference to the tables laid before the Section, the Committee regretted to find that the records of the various institutions did not afford all the information required, to give value to such documents. In the practice of some of the surgeons the facts are all recorded, but the house-books do not contain them; so that the perfect returns only comprise a small portion of the cases. The last return produced by the Committee was the Superintendent Registrar's report, for two years ending June 30, 1839. This document extends over too brief a period to have much statistical value, but affords evidence of great care on the part of the officers. For instance, of 6,621 deaths, the ages are omitted in 14 cases only, and the causes of death in 73 instances. If these entries be compared with the similar ones in the Tables of Mortality for London, they will be found highly creditable to the parties to whom this business is confided. The births reported are 8,218, of which 347, or 4¼ per cent., were born out of wedlock. Of

* The inquiry relative to the Small Pox was not included until several parishes had been gone through, and applies only to 6,362 children out of the 10,856. There can be no doubt, however, that the results are nearly the same as would have been afforded by a wider examination.

the 2,106 marriages, 1,854 were solemnized according to the rites of the Church of England.

Just as the Section was about to rise, Mr. Collier offered a paper 'On the Education of the Blind, and the Deaf and Dumb;' but as the Sectional Committee, without whose previous sanction no paper can be read, had terminated its session, Mr. Collier's contribution could not be received.

Section G.—MECHANICAL SCIENCE.

(Concluded from p. 681.)

WEDNESDAY.

'Experiments to ascertain the power of different species of Wood to resist a force tending to crush them,' by Mr. E. Hodgkinson.—The specimens upon which trials have been made were turned into right cylinders, about one inch in diameter, and two inches long. The apparatus used to crush them has been described by Mr. Hodgkinson in an account of his experiments on cast iron, published in the Transactions of the Association. The crushing surfaces were perfectly parallel, and the body to be crushed had its ends bedded firmly against them, the force being applied in the direction of the fibres. The specimens broke by sliding off in a given angle, dependent on the nature of the material, as the writer had found to be the case in cast iron and other bodies, showing that the strength in any particular species of bodies is directly as the area of the section. Great discrepancies were found when the woods were in different degrees of dryness—wet timber, though felled for a considerable time, bearing, in some instances, less than one half of what was borne when dry. These experiments were made at the expense of Mr. William Fairbairn. [For like experiments on hot and cold blast cast iron, see *Athen.* Nos. 517, 518.] The following were some of the results:—

Description of wood.	*Mean force which crushed the specimen.*
Yellow Pine	4306 lb.
Cedar	4456
Red Deal	4605
Poplar, not quite dry	2440
" turned and tried	3709
Larch, green	2514
" dry one month	4157
Plum tree, wet, though felled two years	3654
" dry	8241
Birch	5953
" dry	5725
Ash	6550
dry	5725
English oak	4891
" dry	7027
Spanish mahogany	6439
Box tree	7355
" dry one month	7277

Dr. Ure suggested, that in future experiments it would be desirable to ascertain what proportion of moisture each specimen contained.

'On the Marquis of Tweeddale's Patent Brick and Tile Machine,' by Mr. G. Cottam.—The first process by this machine is to make a continuous sheet of well-pressed clay, of the proper breadth and thickness. This is then cut into the required lengths. It moulds at the rate of 24 bricks per minute, or 1,440 per hour, and, in a brick-maker's day of 16 hours would produce 23,040 per day; and, in consequence of the compression which the clay undergoes, the bricks do not require one-third of the time to dry them that the hand-made bricks do. The tile machine is a modification of that of bricks. In each case, the clay is made to pass between two rollers, from whence it is brought out in a thin flat cake, and is cut to the requisite width by two wires. It is then conveyed, by an endless web, under other rollers, and, by a simple contrivance, the tiles are cut to the required size, the web farther conveying them on to the shelves from whence they are taken to be burnt. By a modification of the machine, the drain-tile and the pan-tile can be manufactured with equal facility.

In a subsequent conversation, Mr. Cottam mentioned some experiments which had been made on the power of absorption possessed by these bricks in comparison with those made by hand. One of the latter being put into water for six hours, absorbed 28 oz. of water, while a machine-made brick absorbed but 4 oz. Their solidity had also been compared, and this was also much in favour of the machine bricks, the weight of one of which was 8 lb. 19 dr., whilst one of the hand-made bricks of similar size was but 5¼ lb. There was now a manufactory in full operation at York, where about 15,000 per week were produced. The endless web on which the clay ran was moleskin cloth, or velveteens, and which, from the numerous points which it presents, prevents adhesion.

'Experiments upon the effects of Weights acting for an indefinite time upon bars of Iron,' by Mr. Fairbairn.—The experiments, of which the present is a notice, were commenced by Mr. Fairbairn in March, 1837, when a number of bars of Coedtalon iron cast from the same model, 5 feet long and 1 inch square, were placed horizontally on props 4 feet 6 inches asunder, and had different weights, as 2½, 3, 3½, and 4 cwt., laid upon the middle of each; the last weight being within a few pounds of the breaking weight. The intention was to ascertain what effect would arise from each of these weights lying constantly upon the bars. The results are, 1st. The bars are still bearing the loads, and apparently may do so for many years. 2nd. The deflections, which are frequently measured, the temperature being observed at the time, are constantly increasing, though in a decreasing ratio,—a fact which shows that, though cast iron may be safely loaded far beyond what has hitherto been deemed prudent, still it is extremely probable that the bars are advancing, by however slow degrees, to ultimate destruction.

Mr. Scott Russell now made a Report on the proceedings of the committee appointed to inquire into the best form for vessels, (see *Athen.* No. 567–8.) and explained the nature of the experiments in progress.

'Description of a new Railway Wheel,' by Mr. Cottam.—The wheels suggested are made on the following principles:—1st. They are wholly of wrought iron, so welded together, that, independent of screws, rivets, or any other kind of fastening, they form one piece with the spokes. 2nd. The spokes of the wheels are placed diagonally, and act as trusses, thereby giving the greatest possible support to the rim, or tire, and, at the same time, being in the best position for resisting lateral pressure. 3rd. Iron in a state of tension or compression, as is usually the case with the tires of wheels, is easily broken by sudden shocks, or by vibratory action. The wheels in question are so constructed, that the fibres of the iron employed are neither compressed nor stretched, but remain in their natural condition. 4. The strength of iron being as the square of its depth, then the flanged tires of these wheels, which offer sections twice as deep, are, consequently, four times as strong as those of any wheels at present in use. This increase of strength is attributable solely to the peculiarity of their construction, and not to any increase in the weight of the material. 5th. The spokes strike the air edgewise, and thus offer the least possible resistance. Wheels where the spokes present a flat surface may be said to act as blowing machines, and, as such, require a greater propelling power. 6th. These wheels, by simply varying the curve of their spokes, become either rigid or flexible, or, in other words, they may be made to any degree of elasticity. 7th. When worn by friction, the rims or tires may be turned down, and have hoops of railway tire shrunk on them. Thus repaired, these wheels are very strong and durable, and more advantageous than those of other constructions.

Mr. Roberts spoke to the successful use of cast iron wheels, which, properly manufactured, he had never found to fail. The most important consideration to be attended to was the absence of oxide of iron, and if any was on the metal it must be removed by a file. If this precaution were attended to, there would be little fear for the stability of cast iron wheels. —Mr. Woods stated, that on the Liverpool and Manchester Railway cast iron wheels were much used. They had employed wheels with wooden tires at the opening of that line, some of which were still in use; and so satisfied were the Directors, that it was their intention to have some new wooden wheels made, and to submit them to the test of experiment.

THURSDAY.

Mr. Jeffries read a paper on Warming and Ventilating, and gave a description of a Pneumatic Stove.

'On a New Rotatory Steam-Engine,' by Mr. Gossage.—A characteristic of the rotative engine, as originally constructed, is that the whole of its parts revolve in the same direction, and that in whatever position of the revolution its power is always the same, and the relative position of those parts which traverse or move in contact with each other is also the same. Any wear, therefore, which takes place, tends to increase the perfect fitting of the engine. The chamber in which the steam exerts its elastic force, is the segment of a sphere, having conical ends, the points of the cones being towards the centre of the sphere, which arrangement forms an annular chamber. This channel is intersected by a segmental piston, or steam stop, which is fitted to the two cones, and also to the spherical part of the chamber, revolving steam-tight against the ball. A passage is formed through the lower cone, on one side of this piston, for the admission of steam, and a similar passage is formed on the other side for its escape, the communication between which is effected by a vertical shaft. If, therefore, no further means were provided, the steam would pass at once from the inlet passage, through the circular channel, and escape by the outlet passage, without yielding any mechanical force. The extent to which power can be obtained, is in proportion to the prevention of the escape of steam from the inlet to the outlet passage, except in consequence of the action of the engine, which action takes place after the steam has exerted its full force in impelling the piston. The prevention of this free passage of steam through the annular chamber, is effected by a circular disc or plate which surrounds the ball, and extends to the periphery of the spherical chamber, to which it is made steam tight by metallic packing. This disc is so placed, that a radial line on its upper side is in contact with the upper cone of the chamber, and a radial line on its lower side is in equal contact with the lower one. The disc is mounted on a shaft, which, being supported at one end by a bearing placed at a suitable angle to the central vertical line of the chamber, provides for the two sides being at the same time in contact with the upper and lower cones. As each revolution of the steam chamber and disc must be effected in the same time, and as their axes are placed at an angle to each other, different radial lines of the disc and cones will be brought into contact with each other during these revolutions; and any given point of the disc will be continually travelling from the upper to the lower cone, during one half of the revolution; and from the lower to the upper during the other half. The consequence of this traversing motion is, that smaller chambers are continually forming, from the intersection of the main chamber by the disc and piston. These chambers serve for the reception of actuating steam from the boiler, the steam being prevented from communicating with the outlet passage, in one direction by the piston, which divides the annular chamber, and in the other by the close contact of the disc with the upper and lower cones. One of these chambers increases in capacity in direct proportion to the revolution of the engine, until one half of each revolution is performed, when, by the change in the relative position of the disc and cones, the steam received is discharged; and at the same moment that this change takes place, the formation of a new chamber for the reception of the steam commences. The chambers formed on the upper and lower sides of the disc are always in communication with each other, through the slit in the disc; and, therefore, the whole area of the piston on the one side is in constant communication with the actuating steam, whilst this area on the other side is also in communication with the outlet passage, and, consequently, the power obtained is uniformly alike. As the construction provides that the revolution of the disc and cones in contact with each other should effect the necessary alternate communication of the actuating chambers with the inlet and outlet passages, it will be apparent that the valves which are required for effecting these changes in the reciprocating engines are dispensed with, and the whole power obtained being communicated to the rotating shaft, to which the steam chamber is attached, it may be applied at once. Thus, the moving parts necessary, merely consist of a spherical chamber, with its two cones and a shaft, a piston, and a disc with its ball and shaft, the two nozzles and stuffing-boxes for the passage of steam, the bearings for the two shafts, and the framework. The perfect action of these rotative engines depends upon the precision with which the fitting of the two sides of the disc against the upper and lower cones can be accomplished, and the continuance of this precision when the engine is working. As a matter of workmanship, it has been found that this precision is

attainable with engines in which the steam chamber revolves on its own axis, and the two shafts revolve in fixed bearings. There are, however, circumstances connected with the action of the steam, which tend to effect a separation between the disc and cones, and thereby to admit of the passage of some steam without producing an equivalent mechanical force. During one half of the revolution, the area of the lower side of the disc, which is exposed to the full pressure of the steam, is greater than that of the upper side, which is similarly exposed. During this period, the pressure of the steam has a tendency to raise the disc from absolute contact with the lower one, and during the other half of the revolution a similar effect is produced on the upper side of the disc. The extent to which this effect can be produced must be extremely minute, as, to admit of its recurring at all, it is necessary that an actual compression of the metals, or a bending of the disc, must take place, as it is seen that the disc should be prevented leaving the lower cone by its contact with the upper one, and the reverse. Notwithstanding this, it is found that one half of each side of the disc, and one half of the surface of each cone, have constantly a polished surface, from their bearing against each other, whilst the other halves have no indication of being in absolute contact, thus proving that the effect before described does take place. One of the inventors of the new engine (Mr. Davies) was led by the consideration of this action to devise means by which leakage between the cones and disc might be prevented, and the further advantage secured, of rendering unnecessary that mathematical precision of adjustment, which was before required for obtaining the contact of the cones and disc. The principle consists in the adaptation of teeth or cogs to the disc and cones, these teeth being so arranged as to work into each other with great accuracy, in the same manner as the teeth of bevilled wheels. With this arrangement, instead of having a single radial line of contact between each side of the disc and the upper and lower cones, a number of teeth on the disc are in gear with an equal number of teeth on the cones; and as the suitable angle for the two axes is obtuse, this number may be extended to as many as seven teeth in gear at once. Thus, there are provided seven lines of contact in place of one; and as this contact of the teeth with each other is lateral, instead of being the contact of a flat plate against a round surface, any movement occasioned by the unequal pressure of the steam on the two sides of the disc, will only affect the depth to which the teeth are in gear, without disturbing the perfect fitting secured by their contact. For the sake of illustration, the disc and cones may be considered as bevilled wheels: it will be found that the diameter of the disc is considerably greater than that of the cone; yet these, if acting as wheels, must have an equal number of teeth, to secure their performing a revolution in the same time. According to the ordinary construction of the teeth of wheels, it would have been impracticable to effect this object, and it was, therefore, necessary to devise a mode of construction suitable for this purpose. On considering the manner in which the best constructed wheels work together, the inventor perceived that the form considered the best might be made available, the only modification requisite being the adoption of one portion, or the point of the ordinary tooth, for the larger wheel, and the other portion, or its root, for the smaller. This modification being followed, the steam entering the chamber on the actuating side of the piston, will have a tendency to cause the disc to revolve on its own axis, in the direction contrary to that in which it should be impelled by the action of the engine, the amount of this tendency being dependent on the sectional area of the disc, multiplied by the pressure of the steam. The tendency of the disc to revolve on its own axis is overcome by its teeth being in gear with the teeth of the cones, the power necessary being communicated through the teeth, which are retained in contact with each other, whilst the amount of resistance is not sufficient to occasion any material wear. The modification in the construction provides for an engine having only one moving part—viz. the disc, and this part moves in such a position, with regard to those with which it comes in contact, as scarcely to admit the possibility of any derangement occurring. Although this description applies to non-condensing engines, the same principle is equally applicable to those in which the steam is condensed. For this purpose, it is only necessary to provide a smaller machine of the same construction, which, being connected with the condenser, and actuated by the engine, performs the duties of the air-pump, with the advantage of its action being constant, instead of alternating, as in the reciprocating engine. The advantages derived from this application, consist in the simplicity of the engine, which renders it much less liable to derangement than ordinary, and in the reduction in weight and bulk as compared with engines now in use.

A discussion ensued, in which the merits of oscillatory engines were freely canvassed.

FRIDAY.

'On the application of Anthracite Coal to the Blast Furnace, Steam-engine boiler, and Smith's fire, at the Gwendraeth Ironworks near Carmarthen,' by Mr. Player.—The inconvenience of the fire choking for a long time baffled the experiments made on the subject, but it was at last obviated by heating the coal before it reaches the fire, which was accomplished by supplying it, without any mixture of coke or bituminous coal, through a perpendicular chamber placed centrally on the top of the boiler with an opening about 20 inches in diameter immediately over the fire-place. In passing through this chamber, by its contact with the plates, the coal acquires considerable heat, and descending by its own gravity, as the fire consumes beneath, replaces what has been burnt, by which means a regular supply of fuel is furnished, fit for immediate and complete ignition. Another inconvenience is also thus avoided, as fresh coal thrown upon the fire abstracts a quantity of heat from the fuel already in ignition, and checks the generation of steam. The fire is never meddled with; there are no fire drawers; there is no current of cold air passing through the flues, and a very small amount only of draught is required. One engine worked 72 hours consecutively, during which time the grate neither choked nor clinkered; nor was a bar used for the fire, or did there remain any considerable result in ashes. The coal was, in this instance, entirely anthracite, (small, but not powdery) and tipped into the feeding chamber once every four hours. Water was also kept in the ash pit, the steam from which, being decomposed by passing through the fire, the gas forms a jet of flame, creating another active source of power. On these works, there are in action upon this principle, five smith's fires, the tool-maker's fire being blown by a 30-inch bellows only, whilst with this the largest squaring edges for the masons are made with ease. The coal is supplied through an upright brick flue, about 3 feet 6 inches high, 2 feet 6 inches long, and 9 inches wide. The foundry has a similar arrangement, with merely the addition of a flue to take off the flame, the blast being cold, and worked by a small water-wheel, and by which iron is re-melted, running very fluid, and yielding an excellent quality. An oven has also been built for the use of the workmen, heated only with small culm, which succeeds admirably.

'Description of a Machine for cutting the teeth of Bevel Wheels,' by Mr. Davies.—In consequence of the importance of the subject, the attention of practical and scientific men has been for some time devoted to the inquiry, and, at the Liverpool meeting of the Association, Prof. Willis communicated the results of his investigations. The mechanical invention now explained, was to provide the means by which any form, when determined, could be accurately obtained, but applied more particularly to the formation of the teeth of bevelled wheels. In constructing this apparatus, Mr. Davies availed himself of the well-known planing machine, which provides the means of bringing any piece of work attached to its moving table, in contact with the cutting tool of the machine, the cuttings thus produced being in lines parallel with the bed. The arrangement for the machine provides for the wheel being caused to have a revolving movement either in a horizontal or a vertical plane, the combination of these two movements being similar to that of a universal joint. A lever or guide-rod is attached to the frame at one end, and at the other it is confined by a slit, which it fits exactly. This slit is formed in a vertical piece of metal which is attached to the moveable table of the machine. Motion is given to this guide by means of a screw, when it describes the exact curve of the slit, and this movement is communicated to the bevelled wheel through the frame to which it is attached. As the part of this guide-rod which, by its traversing, influences the form, is much more distant from the centre of motion than the wheel, any error in the form of the slit will be diminished on the wheel in direct proportion to these differences. The only precautions requisite in using this machine are to insure that the centre of the cone, which would be formed by the extension of the bevelled wheel, is true with the centre of the bearings; and that the cutter be so placed, that in the traversing of the machine, the centre point will constantly approach the cutting point of the tool.

'Remarks on Bridge Architecture,' by Mr. Dredge.—The writer gave his opinion in favour of bridges upon the suspension principle.

A new Secret Lock without a key, by Mr. Benge, was then exhibited; and a model, sent by Mr. Hamilton, of Edinburgh, was explained, of a method by which the resistance caused by the pressure of the wind against the valves of the organ can be overcome, thereby permitting the largest pipes to be played by the fingers with facility, and also rendering the movement of pedal keys and valves more smooth.

OUR WEEKLY GOSSIP.

By recent letters from Constantinople, we learn that the expedition under Mr. Ainsworth and Mr. Rassam, sent out last year at the joint expense of the Society for promoting Christian Knowledge and the Geographical Society, to explore Kurdistán and the country of the Nestorian Christians, has, owing to the disturbed state of the East, been obliged for the present to return to Constantinople. Quitting Angora [*Athenæum*, No. 603,] in the spring of this year, the party proceeded to the southward, to examine the country of Haïmana, visited the mountain of Ayas, sought for the site of Pessinonte, and returning to the eastward crossed the Kizil Irmak, or Halys, at Kesri Kupri, and thus reached Kir Shehr. Again crossing the Halys, near to the southward, they visited Nam Shehr, fixed the northern point of the great salt lake of Koch-hisar, and travelling along its western shore, inhabited by nomade Kurds, visited Ak-seraï, Injek-sú and Kaïsarïyah. Continuing to the eastward, they examined the sources of the river Saïhún or Sarus, went to Viranshehr, Manjelúk and Garún. From this latter place Mr. Ainsworth explored the sources of the Tokmah Sú, flowing eastward to the Euphrates, and about which so much confusion has hitherto prevailed in our maps, and continued down its valley as far as Malatiyah, where he arrived in the beginning of June. Leaving Malatiyah, their intention was to proceed by Orfa, Harran, 'Ras el Ain, and by the mountains of Sinjar to Mosul; and for this purpose travelled southwards through Samosat towards Birehjík, or Bír, on the Euphrates; on reaching this latter place they found themselves in the immediate vicinity of the Turkish army, when they received every assistance and civility from Hafiz Pasha, but the unfortunate result of the battle of Nezíb, on the 24th of June, rendered the country now occupied by a victorious and invading army, so extremely insecure that they found it necessary for their safety to return to Constantinople. Thus, for the present, the principal objects of the expedition are suspended, but will be resumed immediately that the state of the country will admit of travelling with security: in the meantime, the attention of Mr. Ainsworth, and Mr. Rassam, will probably be directed to some of the minor points contained in their instructions, as the ascent of Mount Ararat; the tracing *backwards* from Trebisond the Retreat of the Ten Thousand; or exploring the valley of the Murád Sú, the great eastern tributary to the Euphrates; any one of these points cannot fail of being of great interest to Geography.

We hear that Captain Washington, the Secretary of the Geographical Society, has been occupied in Cumberland during the recess, in trying the comparative accuracy of different methods of measuring the heights of mountains, as Helvellyn (3055 feet), &c. 1st, by Sir John Robison's glass tubes, for bringing a portion of air from the summits, as described at the Meeting of the British Association, at Newcastle (*Athen.* No. 567); 2ndly, by the temperature of boiling water, as ascertained by a common thermometer; and 3rdly, by Newman's mountain barometer,

as compared with the heights measured trigonometrically in the course of the Ordnance survey.

We are glad to observe that Associations, similar in character to the British Association, find increasing favour on the Continent. A preliminary meeting of the Naturalists and Physicians of the North has been lately held at Gothenburg, for the purpose of establishing a like society, to be called the Scandinavian Association. Eighty-one scientific men assembled on the occasion, of whom fifty were Swedes, twenty-one Danes, and ten Norwegians. The Bishop of Agard was elected President, and Professors Schoum, and Halst, and M. Fahraus, Secretaries, and representatives of the three nations present. A Council was then appointed to draw up a code of laws for the future government of the Society, which is to hold its first meeting, next year, at Copenhagen, and of which Messrs. Oersted and Schoum were chosen Presidents.—The Meeting of the French Geologists at Boulogne went off with great spirit, and, in compliment to the many distinguished Englishmen present, Mr. Fitton was elected President.

Thorwaldsen, who has recently completed some mythological bas-reliefs, is at present occupied with a bust of Holberg, and when that is finished, will undertake, for the Baroness Stampe, a statue of himself in marble. The sculptor is now residing at the beautiful estate of that lady, where she has built an *atelier* for his use. He has lately visited Hamburg, and made many short excursions in the neighbourhood, which have resembled a continued triumph. Wherever he went he was received with processions, speeches, and all the usual manifestations of respect and pleasure: peasants, it is said, came many miles to see him, and landlords refused to accept payment for the refreshment furnished on these occasions,—a proof how far his popularity has extended among the people, however imperfectly the grounds on which it rests may be understood.

We have given, in another part of our paper, the first of a series of letters from Prince Puckler Muskau, which has lately appeared in the *Algemeine Zeitung*: the subject seems to us one of considerable interest at the present moment.

It appears that, in our notice of Mr. Nash's beautiful work, 'The Mansions of England,' we fell into an error respecting Wakehurst Place. We fear we should be less particular in general, if we were quite certain of being corrected by so amiable and accomplished a lady, as the writer of the following letter:

Sir,—You will perhaps think my observations unimportant, but having lived seven years in the beautiful old mansion, which, in noticing Mr. Nash's new work, you call "a curious little brick manor house," I am induced to inform you, that this is one of the most beautiful specimens of domestic Elizabethan architecture; is built of grey stone; and as each wing is 147 feet long, and the centre of the front is 132 feet, you cannot call it *small*.—Wakehurst Place belongs to Joseph John Wakehurst Peyton, Esq., who will come of age in January, when our lease terminates,—consequently 'tis only my love of my old residence, which induces me to address you, and correct your mistake.—I am, sir, yours obediently, Louisa Fairlie.

Wakehurst Place, Ardingly, Sussex,
19th Sept. 1839.

MISCELLANEA

Chemical Powers of Light.—M. Edmond Becquerel has recently communicated to the Académie des Sciences some important investigations on the chemical powers of solar light, which will probably lead to new and valuable results. It has been long known that light has the power of variously affecting certain chemical compounds; sometimes causing combination between two elements, and in other cases effecting the decomposition of compound substances; and it has been found that when a pencil of light is decomposed by passing through a prism of glass, those rays which possess this power are differently refracted from the coloured rays, and hence the existence of peculiar rays, to which the name of Chemical rays is given, has been deduced. The chief difficulty in experiments on these rays has been, the slow nature of the actions caused, and the difficulty of appreciating them. M. Becquerel has overcome these sources of uncertainty, and is enabled to study the chemical powers of light with ease, and measure the effects produced, with considerable accuracy. The manner in which this is done is very simple. Two liquids of different densities, but both conductors of Electricity, and of such nature as to act chemically upon each other when exposed to the influence of solar light, are selected; and a portion of both is put into a cylindrical vessel blackened on the exterior. A plate of platinum is placed in the denser of the two fluids, and another similar plate is also immersed in the lighter liquid; these plates being then connected by means of platinum wires with the two terminations of a very delicate galvanometer, the apparatus is complete. If when thus arranged a ray of light is suffered to pass through the mass of fluid, it causes chemical action to take place at the surface of contact between the two liquids, and a current of electricity which this sets in circulation is immediately rendered evident by the galvanometer. As the angle of deflection of the galvanometer indicates the power of the electric current, and as that is in exact proportion to the chemical action which originates it, it is evident that this arrangement gives an accurate measure of the power of the chemical rays of light, at different times, from different sources and under various circumstances. M. Becquerel details some experiments on the quantity of these chemical rays, which is intercepted when a ray of light is made to pass through screens of different substances, such as rock crystal, mica, and variously coloured glasses; and states that he is still engaged in experimenting on the subject.

Porosity of Cotton.—Fill a common glass tumbler, or other vessel, completely with some spirituous liquor, so that a few drops more would cause it to overflow. This done, you will find no difficulty in introducing into the tumbler, so filled, *a whole handful of raw cotton.* * * Spirits answer better than water, for trying the experiment, from the rapidity with which they are absorbed by the cotton. Several theories were started by persons who tried the experiment; such as, that the filaments of cotton occupied the vacancies between the globules of water; or that by its capillary action the cotton subdivided the globules, and caused them to occupy a less space, &c.; to me, however, it appears to be accounted for more satisfactorily, by supposing the fluid to insinuate itself between the filaments of cotton, and thus permit the latter to occupy no more space than is due to their actual solidity.—*Journal of Franklin Institute.*

Salt Water.—Mr. Miller, employed in the inspection of the Greek manuscripts of the Royal Library of Paris, has stated, in a communication to the Academy, that the ancients were acquainted with various methods of making salt water fresh; that they make mention, among other ways, of distillation, and of receiving the evaporation on sponges, the water expressed from which is perfectly sweet.

Vanilla.—The vanilla has been flowering in the hot-houses belonging to the University of Liége, and where twelvemonths are required to bring the fruit to maturity. In one of the plants the under part of the stem is quite dead, and the rest is entirely nourished by five or six aërial roots, descending into the ground, and by numerous radical tendrils hanging in the air.

Erratum.—Page 696, the title of the first table ought to have been "Annual Ranges," and not *Annual Report.*

13, *Great Marlborough Street, Sept.* 21, 1839.

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